THE JOURNAL OF GAS LIGHTING
WATER-SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1376.] LONDON, SEPTEMBER 24, 1889. [41ST YEAR. Price 6d.

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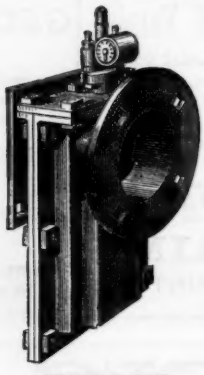

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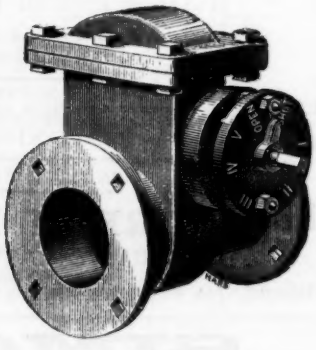

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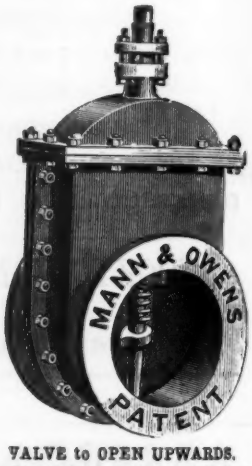

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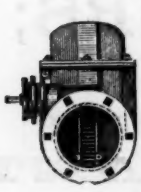

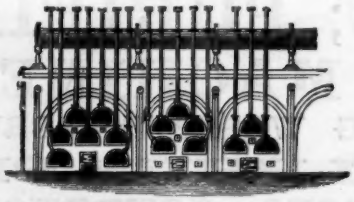

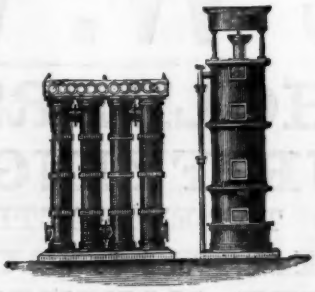

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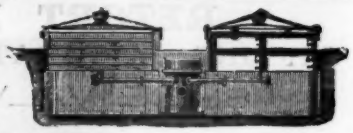

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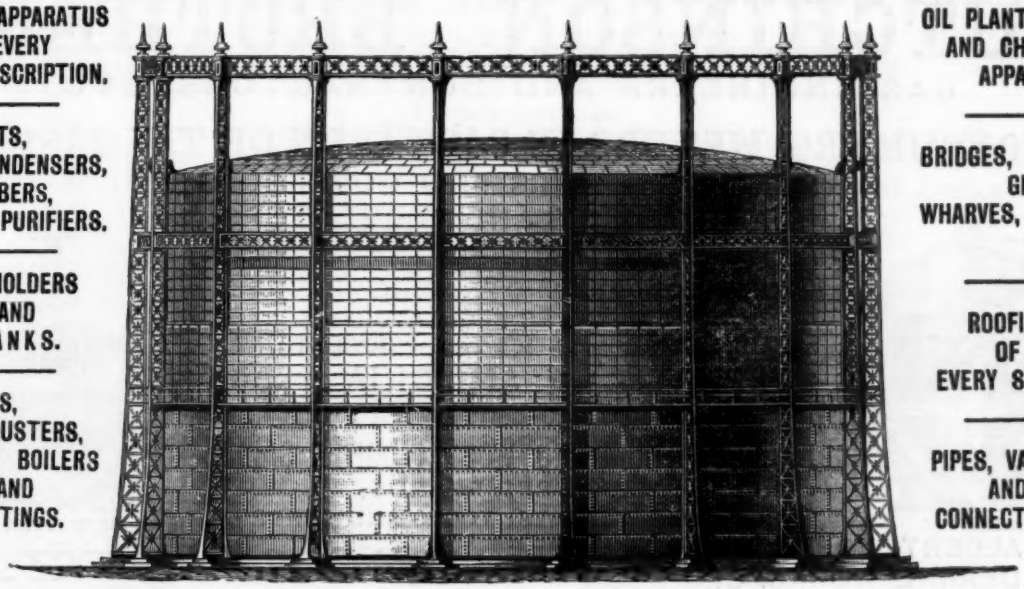

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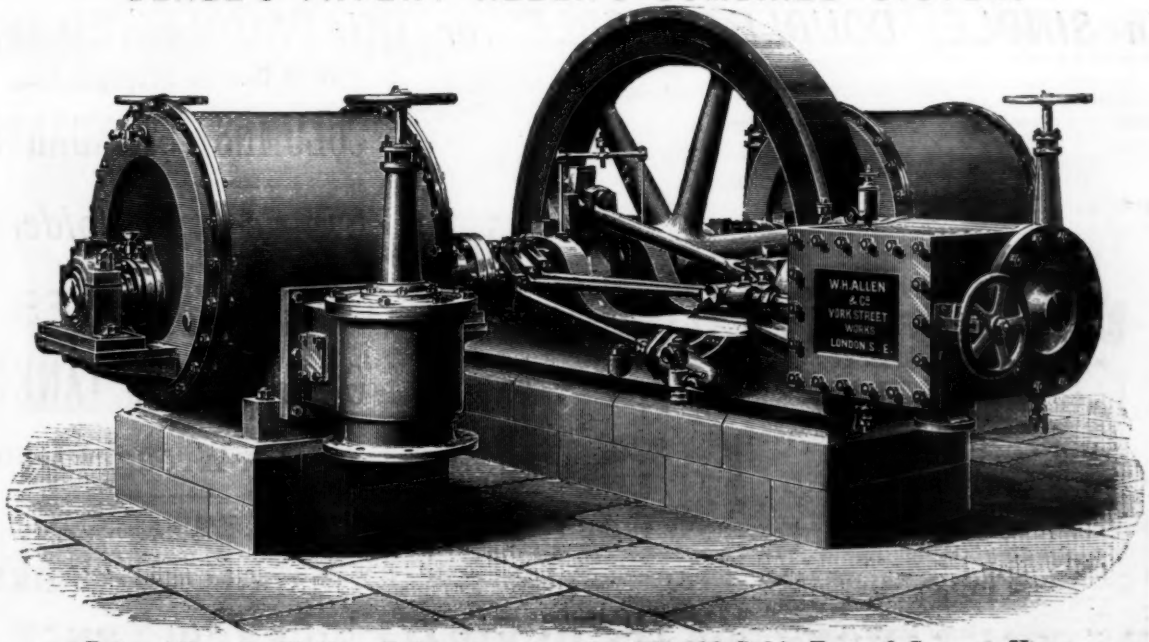

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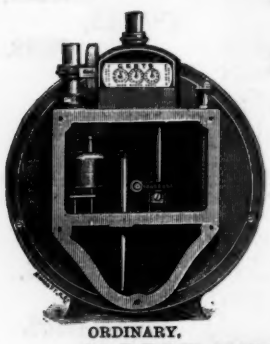

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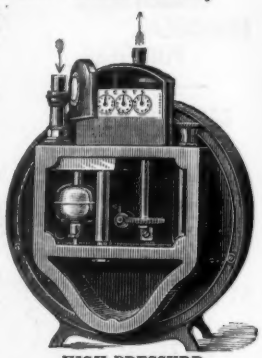

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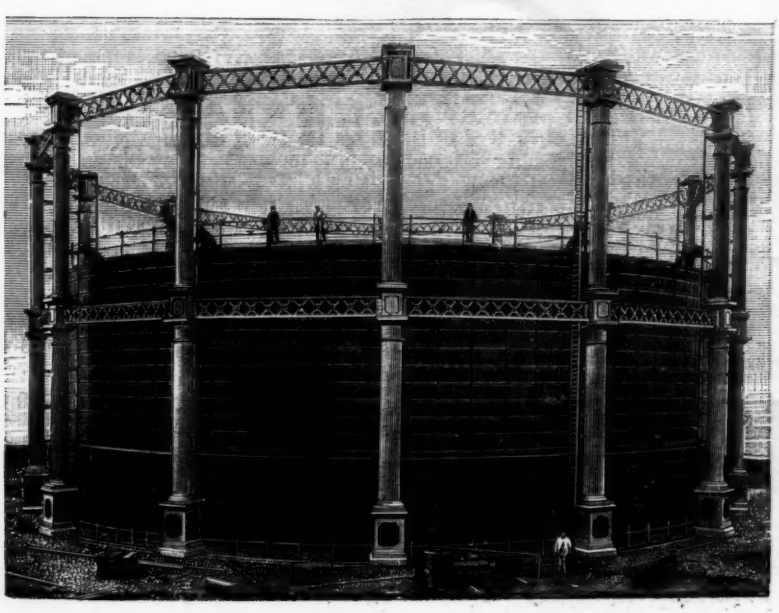

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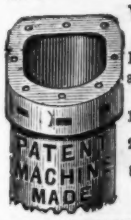

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1. Smooth interior, preventing Adhesion of Carbon.
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MACHINE-MADE GAS-RETORTS.

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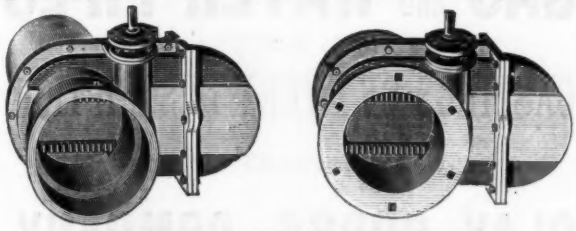

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The pinions of all our Slide Valves are now cut by special machinery from solid forgings. Valves of 10-in. bore and upwards are fitted with double racks, without extra charge. The flanges are all faced and made to standard dimensions, unless otherwise ordered. All valves are tested and guaranteed tight before leaving the works.

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By Her Majesty's Royal Letters Patent.

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The most successful and approved Apparatus known up to the present time.

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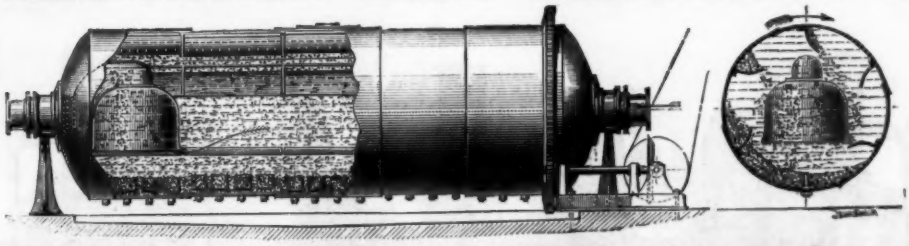
For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

BY AGITATION WITH METALLIC IRON.



MADE IN FOURTEEN SIZES; CAPABLE OF TREATING SINGLY 5000 TO 1¼ MILLION GALLONS PER DAY.
REDUCES ORGANIC MATTER FROM 45 TO 90 PER CENT.; TOTALLY REMOVES MICROBES FROM POLLUTED WATER.

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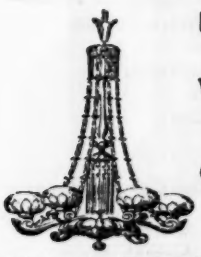

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ROSE MOUNT GAS ENGINEERING WORKS,

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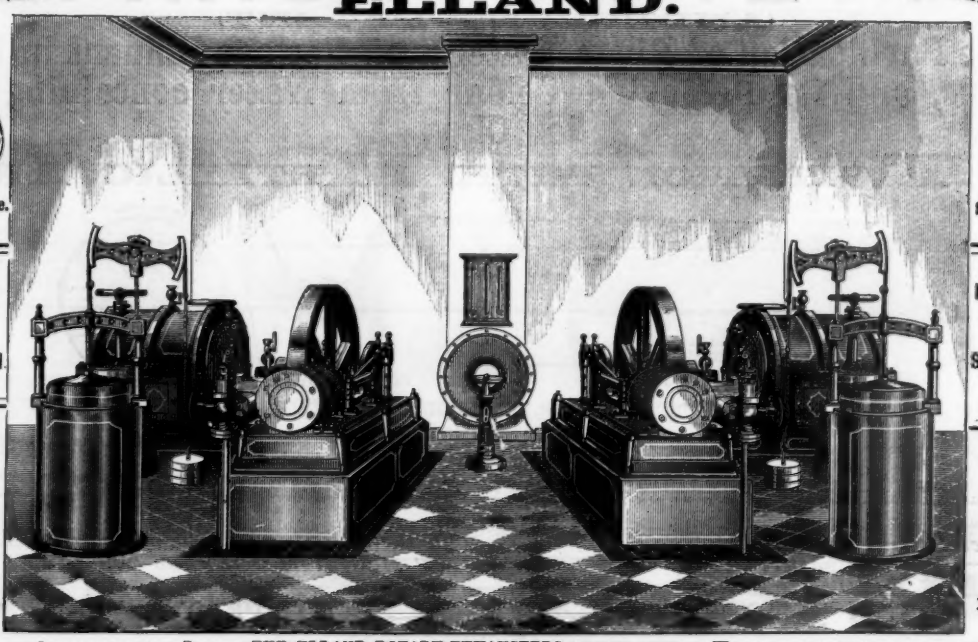
No. 1. Flange Valve.



No. 5. Screw Valve.

NO SLIP.

NO OSCILLATION.

NO HIGH SPEED.

STEADY GAUGE.

No. 3. Screw Valve.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

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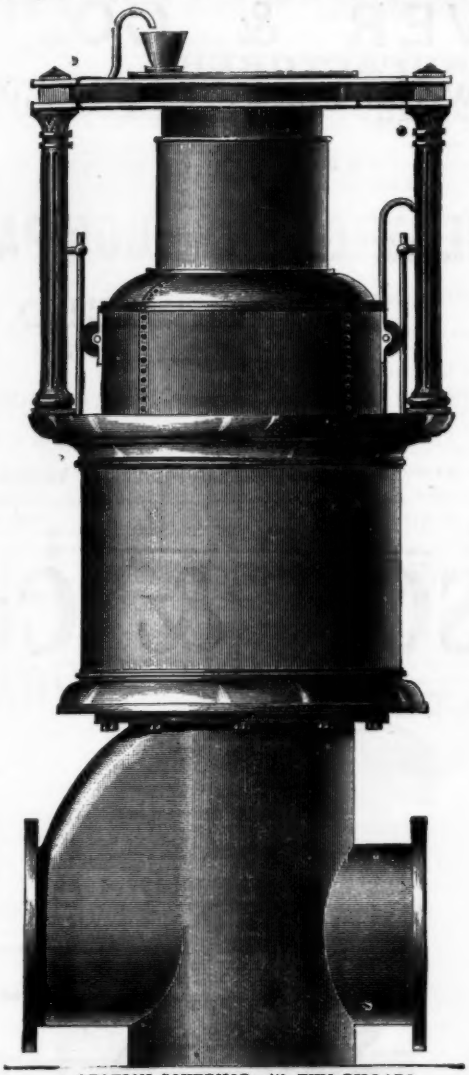
WM. COWAN'S PATENT GAS GOVERNOR.

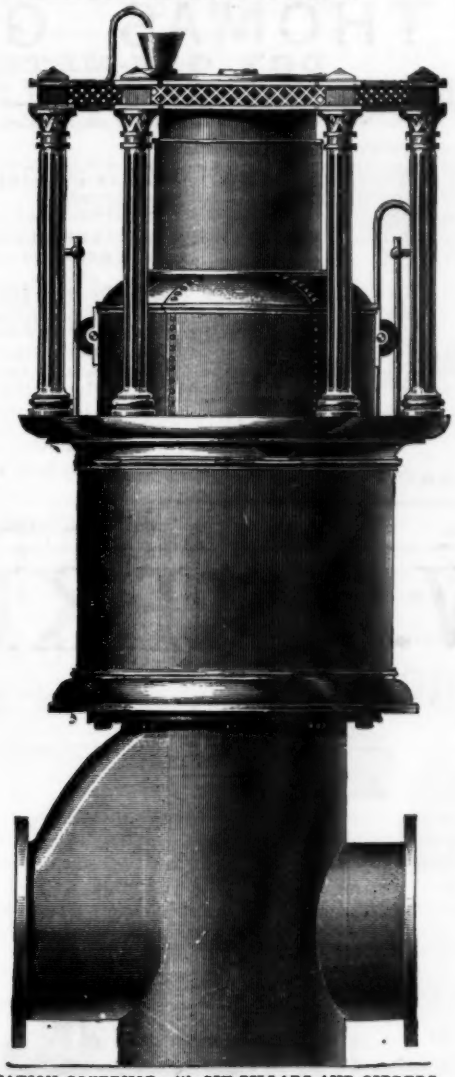
This Governor is a perfect regulator of gas pressure. Unaffected by **even the most extreme and sudden changes of inlet pressure or of draught,** it maintains, without variation, the pressure it is adjusted to give.

This result is attained by balancing the influence of the inlet pressure on the valve-base by an equivalent force, operating *above the roof of the bell.*

Another and a great advantage is the **unique water-loading arrangement,** which is made perfect and complete by the use of **WM. COWAN'S PATENT "STATIONARY SYPHON."**



STATION GOVERNOR with TWO PILLARS.



STATION GOVERNOR with SIX PILLARS AND GIRDERS.

The water loading is further utilized to maintain automatically the depth of the "seal" in the compensating slide. While the loading is going on, the water is first delivered into the slide, from which it overflows into the loading tank below.

We have supplied these Governors to many of the most important Gas-Works in the United Kingdom and abroad, to the Engineers of which we shall have pleasure in referring those who may favour us with inquiries.

W. & B. COWAN,

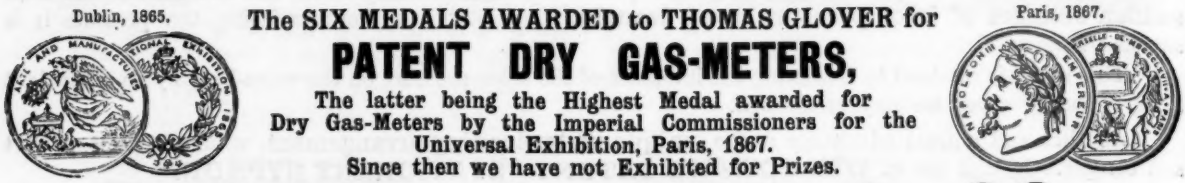
ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER,	DUTTON STREET WORKS,	BUCCLEUCH STREET WORKS,
LONDON, S.W.	MANCHESTER.	EDINBURGH.

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.

London, 1851. New York, 1853. Paris 1855. London, 1862.

Dublin, 1865. Paris, 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

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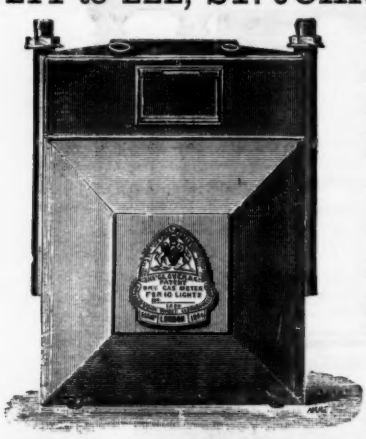

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by frost, however severe.
5th—Are the most accurate & unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
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[See also Advt, p. 674.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 24, 1889.

GAS STOKERS AND TRADES UNIONISM.

THE labour troubles at the London Docks appear to have ceased for the time, and the strike hands, and those who did not join them, are gradually settling down to work together, although not without a good deal of incidental jarring which not seldom eventuates in proceedings before a Police Magistrate. The determination of the dock labourers to obtain increased pay has been carried out to a successful issue more through the active sympathy and assistance of members of other classes of the community than by any strength of their own. The professional Socialists and others who officered them in their conflict with their paymasters take all the credit for the result; but none knows better than Mr. Burns that the strike must have ended, by force of starvation, very speedily after it began, but for the help the men received from outside. They had no Strike Fund of their own to depend upon; and it is absurd to pretend that destitute men, whose only choice of means of living lay between the docks and the workhouse, could have imposed terms of payment for their labour upon a powerful combination like the Docks Committee, unless they had been supported by a public opinion which took the practical expression of a maintenance fund. As was well stated by one of the daily newspapers in commenting upon the strike, and pointing out the lessons in sociology to be drawn from it, the old-fashioned Political Economy which recognized only the law of supply and demand in the settlement of the cost of labour, as of other commodities, must now admit a fresh factor—that of sympathy. It may be that the high-and-dry school of economists who, if they lived in the present day, would be sent to Coventry, or Saturn, by those who have the ear of the public, would have rejected with scorn the suggestion that the sympathy of one class of the community for another could have anything whatever to do with fixing the rate of wages payable to the latter; but these respectable old teachers of much-misunderstood and maligned principles would be shocked as severely by a good many things that are believed and done now-a-days. It is incontestable that Political Economy, in the hands of the first and second generations of its prophets, did an immense amount of good. It supplied a foundation for the system of trade that has brought us where we are to-day; and it disclosed the reasons for many things that had been incomprehensible in the course of commerce and the relations of producer and consumer, employer and employed. It is natural, and in a sense necessary, for the apostles of a new doctrine to exaggerate its cardinal points; and so the early political economists, finding themselves in a world that had been sadly mismanaged through the personal ambitions, emotional government, and false philosophy of its rulers, taught with superfluous vehemence that this was all wrong, and that commercial interests, buying cheap and selling dear, and, in short, the acceptance of the ideas of Freedom of Trade, constituted the only safe rule of commercial and industrial intercourse. Neither did these well-meaning enthusiasts shrink from any logical consequence of the application of their general principles to concrete instances. Wars, according to them, were never justifiable; colonies were a mistake and a burden; nations would agree for evermore as soon as they learnt that their main interest was involved in the preservation of reciprocal commercial liberty; factory regulations were an unwarrantable interference with freedom of contract; and so on. We have changed all this now. On every side we see economical considerations sacrificed to, or modified by, what the old economists would have sneered at as sentiment. Patriotic and national sentiment is stronger to-day than it was in the time of Bentham and Mill. Freedom of contract is perpetually being subjected to restrictions designed to compensate for those inequalities between the contracting parties which the strict economists ignored. And, in the last instance, the community have agreed that employers of a certain class of labour ought to pay a higher rate of wage than had hitherto ruled in that particular market; and the employers have been forced to consent to the advance. Where was the "law of supply and demand" here? Was there ever difficulty in getting any number of labourers into the docks at the old rate? Not the slightest. The men were there, but they said they thought they ought to be better paid, and receive better treatment in various respects; and they obtained what they wanted by the help of outside sympathizers. Political economy was nowhere; but the lesson of its insufficiency to deal with the particular problem cost an enormous sum to teach.

So far we have brought out the part played by public sympathy in winning better terms for the dockers. There is another matter in which the power of sympathy has been as operative, and is quite as much in danger of being obscured. We allude to the change of system in the retort-houses of the London Gas Companies. This has been vaunted as a great victory for the Stokers' Union; but it was nothing of the kind. The men preferred a request—in the form of a concerted demand, it is true. But there was no dispute over it; and the public, so far as any public notice was taken of the matter, were content to know that the condition of a hardworking body of men had been improved in the way they themselves favoured. Probably there never was so great and costly a change in the circumstances of any class of

workers effected so easily, and with such perfect good will on the part of all concerned, as that of the grant of the eight-hour shift to the London gas stokers. The employers did not attempt to deny or defer the alteration asked for; and we do not hesitate to admit that if they had been so ill-advised as to have done so, public feeling would probably have been on the men's side. As it was, the men obtained what they said they wanted; and it is surely preferable that the matter should have been settled in this way than that there should have been all the agitation, turmoil, and bad blood of a strike. A strike has been imminent, however, in the London gas-works ever since the grant of the eight-hours shift; and it is even yet among the possibilities of the near future. If it comes, it will be for such a cause as will forfeit the sympathy of the public. We do not wish to say unpleasant things of the paid managers of Trades Unions; but it is nevertheless necessary to state that, while the community, as a whole, usually sympathizes with, and helps the members of any labouring class to improve their condition, it has no liking whatever for Trades Unionism and the methods of the professional trades unionist. We mean by this, the tendency of combinations of workmen to arrogate to themselves the control of the labour of the industry in which they are employed, and of Union hands to oppress and intimidate those of their fellows, who, for any cause, are not members of the trade society. It is but fair to make every allowance for the feelings of a rough man—one of an order in which the emotions are not schooled into repose, and self-restraint not much cultivated—when he sees the success of a movement, for which he is for the time sacrificing his livelihood, jeopardized by what appears to him the servility and meanness of "blacklegs." If he cannot get the "blackleg" out of the way while the strike or agitation is in progress, he cherishes resentment against him, which is apt to boil over into violence when work is resumed, and he finds himself expected to stand side by side with the man who is actually enjoying the fruit, if there is any, of the victory which his own conduct went to prevent. It is an embarrassing situation for both parties; but the workman has yet to learn that the "blackleg" must be left to the chastisement of his own conscience. Since their return to work, the dockers have done more to forfeit the sympathy of the public, by wreaking vengeance upon the men who did not strike, than they are perhaps aware of; but even they know perfectly well that if they were to come out again on the pretence that they cannot work with those who, in their estimation, played the part of "blacklegs" during the strike, they would get poor subscriptions from the public who helped them to their extra penny an hour.

So it is with the gas stokers. A trade society is a new thing with them; and they may be disposed to overrate its power and strain its machinery. A great many—perhaps the majority—of the members of the Stokers' Union have not joined it of their own free will, but under the terrorism of a few masterful spirits, and of an idea—probably exaggerated—that their lives would not be worth living if they did not go with their mates. Thus a few clever organizers, aided by some loud talkers, have established the Stokers' Union, which is supposed to be very desirous of trying its strength with the works' managers on some points of discipline. It is like a young bear, with a sense of clumsy strength, but with many unsuspected troubles to come. What we remarked last week with regard to the superfluity of a trade society for established gas stokers, is worth repeating. In most well-conducted gas-works, old stokers have an increasing stake in preserving their position as time goes on. They get their holiday, their allowances, and their pension; and it must be a strong Union indeed that can offer to stokers a sufficient inducement to jeopardize all this on a point of jealousy of non-society men, or some such matter. On the other hand, it should be the policy of a good manager to attract a reliable staff of men round him, by treating them well in all respects, and giving them an interest in long service. We have no sympathy with any manager who acts arbitrarily to his men, or with any directors or committee who, for the sake of saving capital, prevent the equipment of works in a way that permits of the men receiving their Sunday's rest. If the strength of a Union is used only for the purpose of "levelling up" the standard of the workman's pay and general treatment, by bringing pressure to bear on employers too selfish or too stupid to act fairly by their men, it is excusable; for there are people who will never do right except under compulsion. We must say, however, that we do not believe gas stokers are often oppressed in any notable degree. Where the Union spirit is objectionable is in its tyranny. Society men are very fond of talking about the "tyranny" of the masters in objecting to employ men whom they dislike for any reason; but they practise exactly the same thing themselves when they propound the rule that none but Society men shall be employed in works where the Union is strong. It has never ceased to be a maxim of Englishmen, that a man should do what he will with his own, provided that it is not to the annoyance of his neighbour. Public opinion, therefore, will neither condemn an employer for choosing whom he will or will not employ, nor a workman for refusing to pay a Society subscription. When workmen display the tyrannical Trade Union spirit, which has led their fellows in other times and places to murder, robbery, and outrage, then the rest of the community perceives that they have a great deal to learn in the matter of showing fair play all round.

Last Saturday the newspapers contained a high-flown declaration of the "National Federation of Labour Union," signed by four men who may or may not occupy the status of the Three Tailors of Tooley Street, who once signed a similar document in the name of the People of England. It appears from this "Manifesto" that these four men want to start a new labourers' society, distinct from the existing Trades Unions in that it is to include all classes of labour, skilled and unskilled, and having for its object the coercion of employers. Workmen are to make their complaints to a Grand Council of Delegates; and if the Council consider the demands of the workmen to be fair and just, they will call upon the employer to concede them, on pain of having his men called out on strike and being boycotted. The beautiful sense of equity expressed here, and the sweet reasonableness of this scheme, must commend it to the favour of all observers. The plan reminds us of some of those imaginary workmen's leagues which one reads about in a certain class of fiction. The fundamental weakness of all these projects is, of course, finance. The workman has no cash to spare for helping everybody else to get more money for less work; and therefore the strongest Unions are those confined to specific branches of industry. Even these are liable to break down in times of depression, just when they are most needed.

To return, however, for a final word, to the Gas Stokers' Union. Superfluous as it is, it will be comparatively harmless for so long as the men see fit to continue to pay for it, provided that it does not interfere with the conditions of work in the retort-houses, nor operate to the intimidation or harassing of men who do not belong to it; that is to say, as long as it does little beyond amuse the men on Sundays. Workmen are apt to lose sight of the difference between persuasion to their own views and persecution; and it will be strange if, through the Stokers' Union, some of them do not learn this lesson at the hands of a Police Magistrate Peace and fair play must be maintained at all costs. There must be no feeble-mindedness on this point. If trade-union arrogance is to be allowed to prevail in any single respect, the whole business of gas supply in London may as well be entrusted to a committee of workmen to manage on socialistic principles, which, as interpreted by Mr. John Burns, seem to be compressed into the simple formula: "Everybody is to do "as I please."

GADD'S SYSTEMS OF GASHOLDER FRAMING.

In another part of the present issue will be found the specification of the supplementary devices by which Mr. Gadd, in conjunction with Mr. Mason, has sought to occupy all the available ground round and about his original proposition of means whereby gasholders can be stayed in a vertical position without guide-framing of the ordinary kind. It is rather to be regretted that formalities connected with foreign and colonial patent laws have prevented our publication of the design of Mr. Pease with the same object, which was promised in the JOURNAL for April 23 last; but this is neither Mr. Pease's fault nor ours. We hope to be freed from these disabilities within the course of a week or two; and mention the matter simply in order that there shall not be any misunderstanding regarding it in the minds of our readers who now see the one scheme disclosed before the other. It is not for us to pass any judgment upon these multitudinous devices of Mr. Gadd, or to prophesy which of them is likely to be the most successful in practice. All this kind of enterprise is good, so far as it goes. It testifies to the re-awakening of interest in a branch of engineering construction that was supposed to be stereotyped in one form; and we

look with confidence for the emergence of new principles of gasholder design from these most ingenious suggestions.

MEETING OF THE EASTERN COUNTIES ASSOCIATION.

The newly-established Eastern Counties Association of Gas Managers had a grand day on Wednesday, at Ipswich, where they were welcomed and fêted by the Directors of the Ipswich Gas Company. The general arrangements were controlled by the Honorary Secretary, Mr. H. Wimhurst; and the local programme was settled by him in conjunction with Mr. J. T. Jolliffe, Manager of the Ipswich Gas-Works. Mr. W. Barratt, of Grantham, presided; and the technical portion of the proceedings included papers by Mr. W. J. Best, of St. Ives, and Mr. John Carter, of Lincoln. Nothing could exceed the kindness and hospitality of the hosts on this occasion; and the members of the Association must have congratulated themselves on the "happy thought" of going to Ipswich, especially at this time of year. Mr. J. Barton, of Peterborough, has been chosen President for the coming year; and the next meeting of the Association will be held in that city. The young Society has shown itself capable of doing useful work; and it cannot be denied that the tract of country which it covers has been sadly neglected by the only Associations that could be said to touch it. Most of the towns in East Anglia are small, for it is an out-of-the-way region so far as manufacture and commerce are concerned. But it is fairly supplied with gas; and the circumstances of its gas managers are so much alike, that there ought to be a genuine bond of fellowship uniting them. The Society has been fortunate in its leaders, so far; which is an immense—indeed, the greatest advantage to any mutual association, old or young.

THE AGITATORS AT SALFORD.

Thanks to the ill-advised action of a section of the Corporation, the affairs of Salford have again some prominence in the Daily Press. We read of meetings and resolutions of petitions and memorials, and of all the other customary evidences of agitation. The object sought just now is to obtain such an expression of so-called popular opinion as will induce the Home Secretary to move for the appointment of a Royal Commission, to inquire into the late frauds and all other malpractices in connection with the Salford Gas-Works. A strong effort is being made to impart some semblance of life to the movement; but so far, in spite of numerous paragraphs in the local newspapers, the evidences of success are difficult to discern. Indeed, there is an air of unreality about the whole performance; and it could not well be otherwise. An agitation directed by the "comrades" of the local Socialist organization, and a few others whose mission in life is merely to magnify their own importance, does not appear to have any special claims to succeed. It is true, no doubt, that the *personnel* of a movement is not of paramount importance where the movement itself has vitality and vigour; but in any case it must count for something. In this instance we have sought so far in vain for one tittle of new evidence such as would justify so extreme a measure as the appointment, thus late in the day, of a Royal Commission. There are assertions, promises, and even threats, in abundance. There is no little bragging, which some of the local newspapers have not hesitated to characterize as downright lying; but of proof there is an absolute dearth. The mainstay of the agitators is the gentleman who has figured prominently, if not with great glory, in connection with the affairs of Salford, Halifax, and Leeds; and whose disinterested efforts to unravel the mystery surrounding them has met with little sympathy. Figuring in congenial society a little more than a week ago, he exercised his talent for invention to the full, and gave reins to an imagination which, if directed to the production of readable fiction, might bring him a fortune. It is only perhaps necessary to refer to his statements that Salford has been robbed of £500,000 or £600,000—that he has been the means of bringing the frauds to light, of securing the punishment of the guilty, and of the restitution, such as it is, of the plunder—to illustrate his claim to be enrolled in the ranks of the authors of modern fiction. His modesty is displayed in the assertions that he has been "invited by the Society of Civil Engineers to become a "member of that body," and that he is "on the list of Inspec- "tors for the Local Government Board." For our part, we believe both these statements to be pure inventions. Any man may write "C.E.," or the whole alphabet for that matter, after his name. But self-conferred honours and titles, although they may deceive the "great unwashed" who are represented by the little knot of Salford Socialists, are not likely to have weight outside that narrow circle. They do not appear, at all events, to have much effect upon the members of the Salford Town Council. Since the meeting referred to, the Town Clerk has written to the papers to say, what was already well known, that this individual has never made any report of the slightest value to the Investigation Committee, and has had no hand in recovering any portion of the money which the Corporation have obtained as compensation for the frauds. He significantly adds that he does not believe the boaster has anything to disclose, and reminds him that he has had access to the Corporation books without producing a single one of the promised astounding disclosures. An anonymous ratepayer of Salford has since offered to give the "gentleman who deals in fiction" no less a sum than £2000 if he will prove any one of his many wild assertions; leaving him at liberty to modify his figures as he pleases. This will afford him an opportunity of doing himself and the people of Salford a good turn at one and the same time; but we do not think it will be taken advantage of.

SIR MICHAEL HICKS-BEACH ON THE RAILWAY AND CANAL TRAFFIC ACT.

The subject of the Railway and Canal Traffic Act has not been mentioned lately in these columns, or, for the matter of that, in any of the newspapers that were so full of it a short time ago. It cropped up again, however, in connection with the recent meeting of the Associated Chambers of Commerce at Hull, when Sir Michael Hicks-Beach, M.P., the President of the Board of Trade, took the opportunity of stating the views and intentions of the Department respecting the much-discussed 24th section, which imposes on the Board the duty of settling a fresh classification of goods, and a schedule of maximum rates to be applied to that classification. When we have mentioned this subject on previous occasions, we have declined to share the alarm that was expressed in some quarters regarding the supposed intention of the Railway Companies to actually charge the rates published by them for the guidance of the Board of Trade; and have looked upon these rates as being exactly analogous to the maximum price of gas permitted to a Gas Company under the old legislation. It was to this point that Sir Michael Hicks-Beach addressed his remarks when he spoke to the Associated Chambers of Commerce; asserting that there has been in the public mind a very great misconception in this regard. He politely assumed that the misunderstanding was not shared by his hearers; but this was a mere courtesy, because he must have very well known that some prominent people identified with Chambers of Commerce in different places have persistently raised the alarm that the new rates would be those actually charged by the Railway Companies, and have altogether ignored their true character. It will be impossible to keep up this illusion any longer; for the President's language was very clear and definite as to what the Department understand by the rates to be fixed under the 24th clause of the Act. They will be the *maxima* for the classifications to which they are applied; but there is nothing to prevent any Railway or Canal Company from carrying goods at as much under the fixed rate as they can afford, always provided that they do not show any undue preference. This last is the centre of the difficulty, where gas-works are concerned. The gas manufacturer argues that for his train-loads of coals, merely taken over the metals of the Railway Company and discharged in his own works, from his own siding, and by his own machinery and workmen, he ought to have a lower quotation than anybody else not similarly situated. The railway manager may retort that the gas manufacturer enjoys quite as much advantage as is good for him, in being able to have a siding, to purchase coals in the largest quantities, and in other ways connected with his dealings in coal; and may decline to grant him any better terms than would be accorded to a coal merchant taking a few truck-loads at a time. This is fair matter for the two interests to dispute over. The Railway Companies can take care of themselves, and the Birmingham Committee of Gas Companies and Corporations will see that the gas interest is properly represented. It is at least satisfactory to notice that the President of the Board of Trade has a firm grasp of the Act, and may probably be trusted to "see fair" between the Railway Companies and their customers.

Mr. Benjamin Robinson has accepted the invitation to become Mayor of Salford for the ensuing year. Mr. Robinson's career as a councillor dates from November, 1885, since which time he has been an active worker on various Committees—among others the Gas Committee.

Water and Sanitary Affairs.

The complaints which have arisen (and to which reference was made in the last issue of the Journal) concerning the development of lead-poisoning in some of the out-districts of Bradford, point to the revival of a too familiar difficulty. The Local Authorities of the districts referred to have called upon the Bradford Corporation, as the owners of the water-works, to remedy the defect. Unfortunately the demand for a remedy can be more easily made than complied with. This is on the assumption that the complaint is well-founded; but it is only fair to state that the Bradford Water-Works Committee maintain that the water as delivered by the Corporation is absolutely pure. It is, of course, a question of fact whether the deleterious consequences complained of are to be attributed to anything done or omitted by the vendors of the water, or to the improper treatment of the supply in the process of transit. In the meantime, it is very naturally being asked whether the steps which were recommended by Professor Thompson, and which the Bradford Corporation undertook to adopt, are being actually put into operation. It is now pretty generally admitted that lead-poisoning, serious or slight according to different circumstances, is incidental to the supply of soft water through a lead service-pipe. Chemists still seem to hold conflicting opinions as to the precise manner in which this injurious result is brought about—whether by a free acid acting chemically on the lead, or by the presence of free oxygen in the water; but somehow or other the result comes to pass, a fact of which the Yorkshire districts alone have again and again afforded unwelcome testimony. We think, as we have already stated, that this must be accepted as a fact, notwithstanding the opinion of more than one expert that the presence of a slight quantity of sulphuric acid in water would be beneficial to the consumer, so far as it could produce any effect at all. It has been suggested that soft water in running through a new lead pipe will dissolve a very notable quantity of lead, but that, after a time, a deposition takes place, causing the pipe to be coated with a salt of lead not soluble in water; so that afterwards the amount of lead dissolved would be too trifling to involve any possible consequence of a serious character. If this view be well founded, of course it follows that hard water may be conveyed through lead service-pipes without injurious results; and that, even in regard to soft water, the poisonous agency could be exhausted by the lapse of time. Such theories may be based on intelligible grounds; but while doctors or chemists differ, the evil grows. The question of how to grapple with it is of vital import to people who live in some of the Northern districts, because supply-pipes are almost invariably made of lead, and no cheap substitute for that metal, possessing like toughness and flexibility, is readily discoverable.

The valuable evidence accumulated in the now well-known case of *Milnes v. The Corporation of Huddersfield*, does not seem, as yet, to have been turned to any really practical account. It was shown in that action that the water from the Blackmoorfoot reservoir dissolved 1-18th of a grain of lead per gallon, after being allowed to stand in a ½-inch lead pipe for twelve hours. For this result there was more than one explanation put forward; but the theory which seemed to find most acceptance was that the soft water from the hilly districts near Huddersfield acted upon the lead by reason of the air it held in solution; the oxygen in the water acquiring a threefold intensification. To travel over the whole field of scientific controversy on the subject would scarcely be profitable. Lord Blackburn, who carefully reviewed the testimony of the different experts, considered that it certainly pointed to the conclusion that lead pipes could not be used without risk in districts producing soft water. But the question, as between Mr. Milnes and the Huddersfield Corporation, had to be decided on legal and not scientific grounds. It will be remembered, however, that the decision of the House of Lords was not unanimous. Lord Selborne refused to be persuaded that the statutory obligation of the Corporation was fulfilled by the delivery into the pipes of water containing foreign, or adventitious matter, which, in passing through them, might cause the water to absorb lead, and so become poisonous in a way which otherwise would not have occurred. For these reasons, his Lordship considered that the plaintiff was entitled to judgment; and the same opinion was adopted by Lord Watson. On the other side, with Lord Blackburn, were ranged Lord Bramwell, Lord Fitzgerald, Lord Halsbury, and Lord Ashbourne, some of whom, it is true, followed Lord Blackburn with considerable hesitation. But the result exempted the Corporation from liability; and defined, beyond all further question, the meaning of the Act of Parliament (the Water-Works Clauses Act, 1847, section 35), upon the discussion of which so much forensic ingenuity had been expended. It was complained by some that the case was decided on technical grounds; but it must be borne in mind, as one of the Judges took occasion to point out, that law without technicality is impossible. Nevertheless, from a public point of view, it is much to be regretted that, as yet, neither law nor science has furnished a successful remedy for the condition of things to which we have directed attention.

The Progress of the Johannesburg Gas-Works.—Under date of the 23rd ult., the local correspondent of *South Africa* wrote: "A highly valuable site, 8½ acres in extent, has been acquired by the Johannesburg Gas Company, and rapid progress, under able management [that of Mr. William Carr], is being made in the erection of the buildings, works, and gasholders."

The Proposed Royal Commission on "Salford Gas Scandals."—There is no saying yet how much or how little truth there is in it, but we give for what it is worth the following paragraph from the *Pall Mall Gazette* of last Saturday:—"We have reason to believe that a Royal Commission will be granted to inquire into the gas scandals at Salford, to which we have from time to time referred. If there is any public spirit in Halifax, a petition will also be addressed to the Home Secretary, praying that inquiry be made into the gas accounts of that town. The Commission would no doubt in that case be empowered to deal with both communities."

Waverley Association of Gas Managers.—The fifty-seventh half-yearly meeting of this Association was held at the George and Abbotsford Hotel, Melrose, on Thursday, the 12th inst.—Mr. W. Robson, of Selkirk, in the chair. The minutes of the last meeting having been approved of, the President delivered a short address, in the course of which he dealt with the subjects of regenerative furnaces, the causes of unaccounted-for gas, prepayment meters and their benefits, and other matters, which led to a good discussion, in which most of those present took part. After the business, the members and friends dined together; and then a visit was paid to the Melrose Gas-Works, over which the party were conducted by the Engineer (Mr. W. Smith), who was congratulated on their efficient condition. The next meeting of the Association is to be held at Duns.

Manchester District Institution of Gas Engineers.—In accordance with the suggestion made by the President of this Institution (Mr. T. Banbury Ball, of Rochdale) at the recent meeting at Bradford, the Committee have arranged for a visit of the members and friends (by the kind permission of the Manchester Ship Canal Company) to a section of the canal works, on Monday next. The programme issued by Mr. S. S. Mellor, the Honorary Secretary, desires the members to assemble at the London Road Station, Manchester, at 12.20 p.m., from whence they will shortly afterwards depart for Lymm. Here luncheon will be served at the Plough Hotel. A few minutes before 2 o'clock the party will take train for Latchford; and on arriving there they will inspect the Latchford and Lymm section of the canal works. The company will return to the Plough Hotel, where tea will be provided. This opportunity of seeing these magnificent works, we have not the slightest doubt, will be taken advantage of by a large number of the members and friends of the Institution.

The Paris Municipal Electric Light Station.—The rules and regulations for the supply of current to private customers in the neighbourhood of the Halles have been issued by the Municipality; and, according to the Paris Correspondent of *Industries*, they are to the following effect:—The mains are laid and supplied by the Municipality, and private consumers have to pay for their own service leads connecting the main with the house. The consumer may wire his house in any manner most suitable to his purpose, provided he uses wooden casings, and generally takes care to have the work properly done. The electric light inspector may enter the premises to ascertain that the wiring has been done efficiently; and if this be not the case, the Municipality may refuse to supply current. Each consumer has to deposit a sum of 5 frs. per glow lamp, and 20 frs. per arc lamp, when the current is first laid on; and this deposit will be returned when the installation is disconnected. When transformers are used, they will be placed inside the houses where indicated by the customer. The current will be supplied by coulomb-meter; the pressure being constant. The type of the meter will only be determined upon when the present experiments with the meters submitted in competition are complete. The Municipality will furnish the meters at the following rentals per month:—5 ampères, 2·50 frs.; 10 ampères, 4 frs.; 20 ampères, 5 frs.; 40 ampères, 6 frs.; 100 ampères, 10 frs. The price to be paid for the current is calculated on a basis of 1·50 frs. (1s. 3d.) per 1000 watt-hours; but there is a minimum charge of 40 frs. for each 10-candle power glow lamp; 60 frs. for each 16-candle power glow lamp; and 400 frs. for each arc lamp. Certain discounts will be allowed to the consumers, according to the total lamp-hours.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 610.)

The past week has been a very quiet one in the Stock Exchange markets generally. The course of ordinary business was broken by the closing of the House on Saturday, and the prospect of two Hebrew holidays next week, as well as the account. A tendency towards flatness, for want of support, has been the rule, which the expectation of dearer money did not tend to relieve. Some of the more speculative markets—such as South African—have, of course, been an exception to the prevalent tendency. The Gas Department, though quiet above the average, has not been quite so neglected as it was the week before. But there has not been the slightest movement in prices, either up or down; every quotation remaining unchanged throughout the week. The market may, therefore, be written down steady. In point of business, the Metropolitan Companies have been inanimate. Gaslight "A" has been very moderately dealt in, at middle figures; and the closing transactions showed no tendency to droop. Small business was also done in the secured issues—both debenture and preference; but without any particular feature. South Metropolitan have been quite overlooked, except for a couple of deals in the "B." A similar amount of business was recorded in Commercial Old. This Company's general meeting will be held, as usual, on the first Friday in October (the 4th prox.), when the accounts to the 30th of June will be presented. It may pretty confidently be anticipated that the Company will be found to have enjoyed quite as prosperous a half year as the two sister undertakings, and to have earned its dividend with a good margin to spare. We shall also be prepared to find in the report that the Directors have resolved to adhere to the handsome rate of dividend which was last declared, and not to recommend any increase in the rate, although authorized by the reduction in the price of gas. We emphatically repeat what we said two months ago with reference to the Chartered Company's dividend, that the present time is decidedly inopportune for such a policy. Turning to the Suburban and Provincial undertakings, the only noteworthy feature is a demand for Alliance and Dublin, which is commanding better figures. Among the Foreign Companies, good debenture securities continue in request; and those of Buenos Ayres and the two Australian undertakings have been moderately dealt in. Imperial Continental is very firm; good enough for a better quotation. As for the Water Department, there have been only two transactions in all the issues which we quote recorded during the week; so they may be dismissed without further remark except that East London is the higher.

The daily operations in gas were: Monday's business was very light, and mostly in Imperial Continental at good figures. European touched top price. Nothing at all in Gaslights. Tuesday's transactions were more distributed through the list, but showed nothing to remark. Wednesday brought no increase of business; and some half-dozen issues were lightly dealt in at about average figures. Gas continued in just the same position on Thursday; everything touched bringing about middle prices. Friday was much the busiest day of the week, and prices were at about their best; but all quotations remained without any variation.

ELECTRIC LIGHTING MEMORANDA.

THE "DAILY NEWS" ON ELECTRIC LIGHTING FOR LONDON—ELECTRIC LIGHTING DISCUSSIONS BEFORE THE BRITISH ASSOCIATION; MR. W. H. PREECE AGAIN—A PRIMARY BATTERY LIGHTING DEVICE.

There was a long article in the *Daily News* last Friday, upon the "Electric Lighting of London," in which the present fashion of free lectures on gas cooking, under the auspices of the Metropolitan Gas Companies, is quaintly adduced as an evidence of the growing popularity of electric lighting. The article is not bad reading, although somewhat spasmodic and gushing in style. We are used to this way of treating the subject of electric lighting; and it does no harm to anything besides the electric lighting industry itself. It is surely time, however, for the friends of electrical enterprise to realize that, if they wish to do business, they must talk business. Yet what do we find even in this composition of current date? Facts and figures such as a householder requires with respect to anything on which he is invited to spend his money? Not many; but, on the other hand, a great deal of vapouring about the change that is to come over the ideas and vocabulary of the typical London householder when he is to talk of "volts" instead of cubic feet, and the wife of his bosom is to be strong on "Board units." "Neither fumes nor streams will interest him; only currents. Instead of 'gas-works,' he will say 'station,' and 'dynamo' for 'retort;' and he will reckon his consumption in watt-hours. In his domestic vocabulary 'contact' will supersede 'explosion;' and 'flash,' 'blaze.' From earthy and Bumbleish, his associations will become empyrean and Jovian." When the bill comes in, we suppose he is to regard the "empyrean and Jovian" element of the electric lighting business as an equivalent for the increased call upon his purse in comparison with that made for the "earthy" gas. Can it be imagined by any sane person that electric lighting is to be recommended by this sort of advocacy? The best that can be said for it is that it is better in this case, because less misleading, than the writer's assertions respecting the cost at which electric lighting can be supplied in London. He declares that "prices"—presumably of electric lighting and gas—"are about equal, if not actually in favour of the new light." This is tolerably bold, especially as a few lines before the confession was made that the cheapness of gas in London had been a serious obstacle to the introduction of incandescent electric lighting. The hardihood of electricians in puffing their business has never yet been equalled even by a quack medicine vendor.

Major-General Webber has read a paper before the Mechanical Section of the British Association on the use of accumulators in the distribution of electricity in Chelsea, in which he declared that storeage is a first necessity for the effectual distribution of electric light from a centre of generation in a densely inhabited area. Seeing that the two largest electric light companies in London scorn accumulators, it would not appear that Major-General Webber is much esteemed as an authority outside Chelsea, where he and his colleagues flatter themselves they are setting an example to the universe. Mr. Killingworth Hedges also read a paper on the precautions to be taken in connection with the alternating transformer system of electrical distribution. Both papers were discussed together, which gave an opportunity for the statement of Mr. W. H. Preece's views upon the supposed danger of electrical currents. Mr. Preece remarked that "there was as much danger nearly—not greater—of fire by introducing the electric light as there was from introducing gas." The chief danger arose from the use of imperfect material, and especially from the employment of inexperienced men; but Mr. Preece did not say, as he might have done, that the exorbitant charges for electrical fitting, by firms calling themselves experienced and reliable, is the great inducement to the employment of cheap men. Having said one reasonable thing, however, it was not in Mr. Preece to sit down without saying something provocative of criticism. In the face of all the experience that has been gathered on the point, he declared that the idea that electric currents of more than a certain strength are capable of killing people is all nonsense. He referred to one supposed case of this kind which occurred at a Brighton brewery, and got a laugh by asserting that the man was killed two hours after the electric current had been turned off. Nobody on the spot seemed to be able to cite any casualty from electric currents; and so Mr. Preece wound up his speech without the correction which might have done him so much good. This has since been supplied by the medical man engaged in the Brighton case, who, by the simplest statement of the facts, makes the celebrated electrician appear very foolish. The observations of Mr. Preece on the subject are the more extraordinary, seeing that an action is actually pending between the deceased man's widow and the electric lighting company, and that the question whether a 2000-volt current is capable of killing a man is likely to go before a British jury.

It is a long time since anything has been heard of electric lighting by primary batteries; all the companies formed for the purpose of exploiting different patents of this class having come to utter grief. Yet it is not so long ago that one primary battery inventor was crowding on the heels of another, and all promising to make such valuable residuals that the lighting by their cells might be given away. An apparatus of this kind was recently described in *La Nature*, and some account of it may be given here for the sake of old times, when we had to do the same service to a fresh inventor every week. It is the device of Commandant Renard, of the French Navy, who originally proposed this form of battery for providing motive power for the driving of a navigable balloon. The balloon being for the time under instead of in the clouds, M. Renard has adapted his battery to the purposes of lighting. It takes 36 elements to supply an arc lamp of 300 candles; and 7 elements will feed a portable incandescent lamp of 25-candle power. Although the name of "portable" is given to these lamps and their actuating battery, it is almost a complimentary appellation; for the lamp, with its box of elements fully charged with chlorochromic liquid, weighs 15 kilos. One of these arrangements is credited with being able, as a maximum duty, to maintain a lamp of 25-candle power for eight hours with an expenditure of chemicals costing 2·50 frs. The French reporter is driven to confess that this is tolerably expensive lighting; as well he may, seeing that the cost of a petroleum lamp for the same period would scarcely be more in centimes than the battery lamp costs in francs. He consoles the electrician, however, by remarking that in a great number of cases the consumer cares little for expense in connection with domestic lighting *de luxe*. This is the frail hope to which electricians everywhere cling—that their light will be so highly esteemed that people will hardly care how much they have to pay for it. At the very best, however, the number of people so circumstanced in any centre of population must be a very small fraction of the community; and in deliberately choosing these for their only possible clients, electricians abandon the hope of catering for the multitude.

The Commissioners of the District of Columbia have lately been listening to remonstrances from the leading hotel proprietors regarding the enforcement of the Commissioners' order that water-meters should be put in all the hotels. They were, says an American contemporary, represented by counsel, who considered that to require hotel-keepers to receive their water supply through meters was forcing them to adopt an experiment. The only experiment will be on the part of the hotel proprietors when they are compelled to pay for water through meters, as that will plainly demonstrate to them the amount of waste that is constantly going on in their houses, and which they can readily prevent. In view of the experience of several other authorities, it seems hardly likely that the Commissioners will take a backward step in the matter.

THE PROBLEM OF THE DAY.

The labour troubles by which gas managers of the United Kingdom are now confronted, will have the effect of directing their attention once more to the possibilities of rendering gas production independent of trades union combinations. This can only be done in one way—by so utilizing machinery as to reduce to the minimum the dependence upon a plentiful supply of trained stokers, which is now shown to be one of the weak points of modern gas-works administration. The Stokers' Union will result in improving the stoker off the face of the earth, if its wire-pullers persist in pitting themselves against the mechanical resources of the age. They may flatter themselves that gas making is one of those branches of industry in which mechanism can only be applied to a limited extent for the substitution of hand labour; but this is an error. It is true that manual labour is still employed in the production of the bulk of the coal gas made in this country; but one reason for this is the indifference, if not the positive objection, that has often been displayed by gas managers and their superiors when proposals have been laid before them which would have the effect of radically changing the system of retort-house working. When stokers gave no trouble beyond the ordinary ones incidental to all factories, gas managers were by no means anxious to be rid of them. Some take a kindly interest in their men, and enjoy the position of liberal employers of labour which the prosperity of gas undertakings permits them to occupy. Others have been averse to the unknown troubles and responsibilities attaching to the introduction of novel machinery. Others, again, have regarded proposals to substitute machinery for hand-labour from the purely economical standpoint, and having failed to find sufficient inducement, by way of probable saving of money, for reducing their retort-house staff, have neglected machinery altogether. The very echo of the word "strike" is enough to change all this "let-alone" attitude into one of purposeful curiosity regarding automatic or mechanical methods of gas making; and this is therefore a good opportunity for looking over the resources actually at the command of gas managers, by recourse to which they may make themselves more independent of strikes and strikers, and at the same time for drawing attention to suggestions of the same character which have hitherto been neglected because of the lack of occasion to employ them. The question of mechanical gas production, in short, has been played with hitherto in places; but now it has become serious.

The first step in the direction of emancipation from the tyranny of the fireman has been taken by those gas managers who have adopted generator or regenerator firing; for this class of furnace is not so dependent upon trained manipulation for maintaining the heats in the settings as the old-fashioned direct-acting furnace. With an experienced foreman to look after the air inlets, any scratch labour can keep up better heats with a generator furnace than the most skilful—and consequently in too many instances the most unreliable—fireman of the old school with furnaces of the other kind. After the furnace comes the retort; and it is but natural that engineers should pause to ask themselves whether the mechanical stokers of the present type have, as a matter of fact, rendered them as independent of the human element as could be wished. We have some delicacy in discussing this point, because mechanical stoking at the present time, and in this country at least, means the West appliances in their different modifications—hand, steam, and compressed air. Without the slightest desire or intention to say anything derogatory of the West system, we do not hesitate to declare that it does not settle the stoking difficulty. If fewer men are required, they are still stokers, and must, as a matter of fact, be trained ones to work the West process to the best advantage. It is thus tolerably clear that escape from the labour difficulty can only be by two ways—either stoking, or rather we should say gas making, must be rendered so easy that any able-bodied labourer might manage it, or it must be effected wholly by automatic machines, the attendants on which might be mechanics or young engineers not belonging to the stoker class. It is the weakness, as well as the strength, of the West system, according to the standpoint of the observer, that it takes the gas-retort as it is, without any attempt to improve it. To those engineers who think that horizontal retorts with comparatively light charges are the ultimate expression of gas making, the West system may appear perfect of its kind; but even this will not be admitted by others who compare the weight of the machinery with that of the human beings who do the same work. If the gas-retort is to remain a small horizontal tube into which a few hundredweights of coal are put every four or six hours, and rather more than half the weight of coke is drawn at the same intervals, it is impossible to ignore the consideration that, weight for weight, the man is far and away the most efficient machine that has yet been applied to this purpose. If we must have heavy and complicated machines, by all means let us have something that will do for gas making what the self-binder reaper does in the harvest field; but this remains to seek.

Beyond the mechanical stoker comes the problem of modifying the dispositions of the retort setting itself—supposing, of course, that retort settings still retain something of their present character and are not done away with to make room for cupola gas generators of the Loomis or some allied type. The most obvious modification is that of inclining the retorts at such an angle from the horizontal as to combine the possibility of expansion of the coal under the influence of the heat—which can only take place in a retort that is horizontal, or nearly so—with that of discharging the coke automatically when formed. Two months ago we discussed this subject when reviewing the actual state of gas engineering; but no apology is needed for recurring to it, now that stoking has taken the most prominent place among gas makers' cares in a way that could hardly be foreseen even such a short time ago. The Coze system of inclined retorts has improved its position in the meanwhile, for Mr. Morris is about to try it on a sufficiently large scale at Southall; and as the Brentford Company are, after a fashion, experimentalists for The Gaslight and Coke Company, the arrangement may go farther than Southall if Mr. Morris thinks well of it. We shall probably shortly publish some information relating to the Ludlow experiment in the same direction, which has been well spoken of by competent critics. Beyond these we know of nothing stirring in the same line; but now is the time for engineers having projects of the kind in their desks to bring them out and ask for opportunities for trying them. The last word has not been said upon mechanical gas making, with or without radical modification of the retort system; and any engineer who has a respectable project for disestablishing the stoker, can be certain that now he will not be snubbed by his directors for mentioning it.

We believe that there is plenty of ingenuity available for this kind of application, provided that there is such a demand for it that perfection will not be expected to begin with. A great difficulty that inventors of gas-making processes have had to contend with in the past, has been the narrowness of the margin of advantage for their schemes as compared with hand-labour. So long as it was understood that hand-stoking could be had at a reasonable figure, the mechanician was loaded with the onus of proving his suggested improvement to be cheaper as well as better than the system which it was intended to supersede. No chance of imperfection was pardoned; and if the slightest alteration of the structure of retort-house or any other building were needed, it was enough to condemn the project. Circumstances have arisen, however, to make the most routine gas manager in England understand how it is that a water-gas generator, standing for the most part cold and unused in a corner of the retort-house, is an unspeakable comfort to an American coal gas maker. There is no law to prevent British gas managers from following the same course, provided they keep up the quality of the output; and even this requirement would not trouble them to any very great degree in places where the municipal authorities own the gas-works, and make a pretence of checking the product.

It would be impossible to pretend to say what form the strife of machinery against labour combinations may take in the near future; whether it will be improved stoking machinery, modified retort settings, or the adoption of cupola gas generators. In any case, there is a call for the legitimate employment of capital and intellect to checkmate the arrogance of labour unions, directed for the most part by men who have their own purposes to serve in fanning the feud between employers and employed in the gas industry. It is not an occasion for the display of any feverish impatience for the acceptable solution. If this is coming at all, it will come in its own time, and cannot be hastened by the offer of prizes or any such device. The best assistance that can be rendered in a case of this kind is by the extension of a kindly, but at the same time judicious, welcome to inventive efforts. No good will follow from patronage of radically weak schemes, the failure of which on trial might strengthen the popular impression that manual labour must continue to be the rule in the gas making industry. All that we argue for is that wealthy gas companies and corporations should be at this time a little more open than has hitherto been their rule to provide opportunities for testing stoking devices aimed at the reduction of retort-house labour. There may not be a great deal of money in these projects, from the inventor's point of view, and therefore clever men may have thought that their ingenuity would meet with more reward in other fields. The matter touches an industrial and social reform of some magnitude, however, and should not be allowed to fall into neglect on account of the apparent smallness of the pecuniary reward for the man who should succeed in solving the problem. Gas stoking is not a particularly pleasant calling, perhaps, although there are many worse; and it would be a good thing to relieve men from the necessity of following it, especially when they show themselves so difficult to please in various respects. If, therefore, an inventor should propound to any gas manager a scheme for abolishing the gas stoker by means of a carbonizing process or retort-serving machinery, he should be listened to; and if his plan recommends itself as workable and promising, it should be fairly tried. If not perfect at first, perfection may come with experience. A few months ago it would have been difficult to persuade the majority of gas directors to entertain an automatic gas making device; but times are changed, and policy must change with them. We shall always be willing to receive, and if desirable to publish any suggestions of this character that may be submitted to us. The reduction of manual labour in gas making is the question of the day; and the successful answer to it will be more than the triumph of an hour.

The capital of the Cincinnati Gas Company has lately been increased from $6,000,000 to $6,500,000, so as to meet the expenses of extensions of the plant and mains; about 15 miles of the latter being put down each year. General Hickenlooper, the President of the Company, states that an addition to the capital is needed every five years, to cover the cost of improvements necessitated by the growth of the business.

THE "AMINES" PROCESS AT WIMBLEDON.

For some time past the "Amines" process for the treatment of sewage, invented by Mr. Hugo Wollheim, has been on trial at the Wimbledon sewage works; the operations being conducted by a Syndicate, of which Mr. E. B. Ellice-Clark, M. Inst. C.E., is the Chairman, and Mr. Wollheim the Managing Director. The Wimbledon Local Board in this instance, as in others where the same object has been in view, have allowed the use of their tanks for the purpose of affording a practical test as to the value of the process employed. Mr. Wollheim's method has answered so well that the Board contemplate its adoption; but, as a preliminary step, have arranged that the plan shall be worked for six weeks by their own officers. If the results are satisfactory, an agreement will be entered into, probably in the shape of a royalty to be paid to the Syndicate; the Local Board taking the working of the process into their own hands. Matters having advanced thus far, a public demonstration took place on Wednesday last, when, in response to an invitation from the Syndicate, a visit was paid to the works by the Lord Mayor, accompanied by several members of the Corporation and the County Council, together with mayors of provincial towns, medical officers of health, scientific chemists, engineers, surveyors, and others interested in sanitary work; the entire company numbering fully two hundred. The task of explaining the process and the operations connected with it, was ably fulfilled by Mr. Ellice-Clark, who conducted the visitors over the works. Previous to the intervention of the "Amines" Syndicate, the Local Board had been employing a process of their own, in which the sewage was treated chemically by means of lime and sulphate of alumina, supplemented in hot weather by permanganate of potash. The effluent was run on to land, and utilized in the production of Italian rye-grass, mangolds, and vegetables. Much attention was also given to the production of willows and osiers. The sewage farm is 70 acres in extent, and is situated within five miles of Westminster Abbey. In a paper read before the Society of Engineers in the spring of last year, by Mr. W. Santo Crimp, it was stated that the cost of the works and the land had amounted to more than £53,000. Despite all that had been done, Mr. Crimp looked for further change. The rapid growth of the Metropolis westward was likely to disturb the present arrangements, and already houses were built on the very verge of the farm. As if anticipating that which is now coming to pass, Mr. Crimp stated: "It may be that the time is not very far distant when some other site for the sewage-disposal works will have to be sought, or the aid of chemical science invoked, so as to render land-treatment of the effluent from the tanks unnecessary."

If that which was shown to the visitors at Wimbledon on Wednesday can be continuously maintained, without excessive outlay, and without any unforeseen drawback, Mr. Santo Crimp's ideal may be verified. It is dangerous to judge from a passing "demonstration;" but, so far as appearances went, there was much to encourage. The means employed were certainly strange—consisting of milk of lime and herring-brine. When it was stated that, on an average, 47 grains of lime were to go to a gallon of sewage, some of the visitors expressed their astonishment. Of the herring-brine, there was only to be 3 grains. The company were shown the mixing-house, where the milk of lime was impregnated with the herring-brine, and both were cast into the sewage; after which the whole was pumped up by steam power, and sent along an open conduit to the settling-tanks. It is claimed for this process that it deodorizes the sewage prior to the precipitation. Wednesday was rather a cool day, though sunny; but certainly we did not detect any smell from the sewage as it travelled on its way. Passing by five tanks, it entered a sixth; and there the precipitation process commenced. There was more or less of sewage in all the tanks; but there was no odour. The depth of the sewage in the sixth tank was 6 feet, and the quantity 85,000 gallons. It was stated by Mr. Ellice-Clark that precipitation would be complete in half-an-hour, when the bottom of the tank would become visible. The plan pursued was that of running off the clarified sewage, and filling the tank again twelve times, before removing the sludge. As the spectators were watching the tank, the top water began to flow over into the next compartment, forming a cascade that glittered in the sunlight, and appeared to be almost perfectly clear. There was a slight odour, whether of a "briny" character or otherwise became a matter of opinion. Still it was slight, whatever it might be. Samples of the water had a tinge of opalescence; but this was not much. Some two hours afterwards, on visiting the farm, we found the effluent from the tanks collected in a well, whence it overflowed into the carriers leading across the field. From this well samples were drawn into ordinary tumblers, and had the appearance of proper drinking water. The taste, however, was different; being chiefly indicative of caustic lime. Confessedly, the effluent is a little too strong to suit the fishes which may happen to encounter it. But it is contended that the tributary stream from the sewage works will undergo such ample dilution when entering the river, that the finny tribe will be practically safe.

It is claimed for the Wollheim process, that by the action of the lime on the herring-brine a powerful disinfectant gas is evolved, which, being highly soluble, quickly permeates the whole of the liquid in which it is contained, and entirely arrests putrefaction. The gas, to which Mr. Wollheim has given the name of "aminol," is held in solution with great tenacity, and has the property of destroying all bacterial life. On this ground it is asserted that the effluent has no need for any subsequent filtration through land, but may be sent direct into the river. At Wimbledon the river would be the Wandle, discharging into the Thames some two miles distant. Another question has reference to the sludge. This is said to be free from all tendency to become putrescent, and may be dried in the open air without offence. One of the results shown last week consisted of a quantity of dry sludge, filling up about 2 inches of a shallow trench in which it had occupied 8 inches when wet. It appeared to be largely impregnated with lime, and was quite without odour, unless tested very closely in the hand. From this it was argued that the expensive process of pressing could be dispensed with; the sludge being available for raising the level of marshes and other low-lying lands. At present the sludge is drawn off from the bottom of the tanks into a press-house, and there deprived of its moisture by compression. Samples of the press-water were singularly clear. The sludge was also shown in the condition of a dry cake, and as a powder; but no value was claimed for this product.

Having inspected the works, the visitors adjourned to a tent, where Mr. Ellice-Clark delivered a very interesting address. He stated that the cost of the materials for treating a million gallons of sewage would be from £2 10s. to £3. Any plant erected for applying a chemical process to sewage would suit their purpose, and no further outlay would be required. At Wimbledon their only additional machinery consisted of "half a petroleum cask." In reply to questions, Mr. Ellice-Clark stated that very large quantities of herring-brine were obtainable; but they were not limited to this article for the purpose of carrying out their process. Mr. Townsend, the Chairman of the Wimbledon Local Board, said he had seen various plans tried at their sewage works, but he certainly had never met with any experiments at all equal to those of the "Amines" process. Mr. Godfrey, Surveyor, of King's Norton, inquired what effect the process would have on sewage containing manufacturing refuse. Mr. Ellice-Clark replied that this had been tested at West Ham, where numerous factories and chemical works existed. Dr. Klein's analyses showed that while bacteria abounded in the sewage, there were absolutely none in the effluent. The sewage experimented upon amounted to 160,000 gallons. Mr. Walter Hunter, of Bow, a member of the Main Drainage Committee of the London County Council, at the close of the inspection, proposed a vote of thanks to Mr. Ellice-Clark and the Syndicate, which was cordially adopted and suitably acknowledged; after which the proceedings terminated.

The British Association a Failure.—The decadence of the "British Association for the Advancement of Science" (to give it its full title) is now coming to be recognized pretty generally. Of late years, we have again and again made allusion to the paucity of really scientific matter brought before, and discussed by, its various Sections; and now, not only those who attend the annual gatherings, but newspaper commentators in different parts of the country, are beginning to find out the hollowness of much of its proceedings. Only last Friday that *ultra*-Tory paper the *St. James's Gazette* remarked: "The British Association closed their scientific labours yesterday with a final picnic. It has been a very 'successful' meeting, so it is said—that is, there have been a large number of entertainments, many of them gratis; and the scientific ladies and gentlemen enjoyed themselves exceedingly. The cause of science was advanced by means of lectures on Socialism by very young gentlemen, and lectures on stays by not so very young ladies. There were also learned papers by very eminent engineers, mathematicians, and geologists; but as they were mostly delivered to empty benches they hardly count. On the whole, as a pleasant cheap trip, the British Association meeting may be recommended. When the rather hollow pretence that it is meant to cultivate serious science has been finally abandoned, it will be pleasanter still."

The Sanitary Institute.—In the Journal for the 13th ult. we gave a general preliminary notice of the eleventh annual congress of this Institute, which opens to-day in Worcester, under the presidency of Mr. G. Woodyatt Hastings, M.P. The completed arrangements, as set out in the official programme, a copy of which has been forwarded to us by the Secretary (Mr. E. White Wallis), bear out the promise given by the particulars which had previously reached us that the meeting would be one of considerable interest. Apart from the value of the proceedings to sanitary engineers, the city and its neighbourhood present many attractions, which are all duly notified in the programme. In connection with the congress, there will, as usual, be an exhibition of sanitary apparatus, heating, lighting, and other appliances, which will remain open till the 19th prox. For the purpose of this exhibition, the Skating Rink and its annexes have been secured; and an important feature will be a series of cookery lectures to be delivered during its continuance. It may be convenient to mention here that the Council of the Institute have issued the programme of the eighth course of lectures and demonstrations specially arranged for sanitary officers and others preparing for the Institute's examination for nuisance inspectors. They will be delivered at the Parkes Museum, Margaret Street, W., on Tuesdays and Fridays during next and the succeeding month; commencing on the 8th with an introductory discourse by Sir E. Chadwick, K.C.B. The subject of water supply will be dealt with on the 11th by Dr. Louis Parkes; and on the 22nd, Professor Corfield will describe the various kinds of sanitary appliances. The course will close with two lectures on sanitary law, by Mr. A. Wynter Blyth, who, as a barrister-at-law and a medical officer of health, should be able to deal effectively with this important part of a sanitary engineer's education.

Notes.

The Last New Gas Process.

An amazing statement is made on the authority of an American newspaper—nothing less than that a Mr. Hitt, of Anderson, Indiana, has succeeded in solidifying natural gas. This wonder-worker, whose method has been submitted to the United States Patent Office, states that in his first experiment he took "800 quarts" of natural gas, and after considerable labour and expense, succeeded in reducing this bulk of matter to one quart. The result was a darkish gray substance, of the consistency of butter, which did not apparently contain anything similar to oil or grease, but was, naturally enough, highly volatile and would readily return to its natural state upon exposure to heat and the air. Unfortunately, Mr. Hitt could not give the newspaper reporter a sample of this remarkable substance to take away with him, as it had all been used for heating a stove as an experiment. We are told, however, that it burnt, at the end of a pipe connected to the bottle which contained it, with a dark-blue flame of intense heat. Although the first sample was expensive to make, the process is to be very cheaply worked, so much so that the product is to be sold for less than crude oil. The unfortunate gas companies of the States will have to look out for themselves, as Mr. Hitt declares he can construct a large retort or reservoir in New York city, ship the condensed gas in barrels or tanks, and it would only be required to put this mysterious substance, which looks like dirty butter, but is not, into the gas-making retorts for it to resume its original form and be distributed through the existing gas-mains. In this way Mr. Hitt is confident of being able to supply gas to New York for less than 50 cents per 1000 cubic feet. With this astounding prophecy the preliminary notice concludes.

The Estimation of Furnace Efficiency.

A rapid method for estimating the efficiency of furnaces is suggested by Dr. G. Lunge. It consists in calculating the effect of the proportion of carbonic acid found in the chimney gases. The determination of the carbonic acid of the chimney gases shows the amount of oxygen and nitrogen; for if n represents the percentage volume of carbonic acid in a sample of gas taken from a flue, then $100 - n$ represents the volume per cent. of oxygen *plus* nitrogen. Whatever the composition of the coal or coke used as fuel, 1 kilo. of carbon forms 1·854 c. met. of CO_2 at 0° C. and 760 mm. pressure; thus every kilo. of C. burnt in the furnace there must be $1{\cdot}854\frac{100-n}{n}$ cubic metres of oxygen and nitrogen. If then T represents the temperature of the smoke gases, t = temperature of the air, c = specific heat of a cubic metre of CO_2 (up to 150° C. = 0·41, from 150° to 200° = 0·43, from 200° to 250° = 0·44, from 250° to 300° = 0·45, from 300° to 350° = 0·46), and c_1 = specific heat of a cubic metre of O or N (about 0·31), then the loss of heat, X, in the furnace for every kilo. of carbon burnt, expressed in calories, is $X = 1{\cdot}854\ (T-t)\ c + 1{\cdot}854\ (T-t)\ \frac{100-n}{n}\ c_1$. The calorific value of the kilo. of carbon is 8080 calories; consequently the formula $\frac{100\ X}{8080}$ indicates the proportionate loss of heat by the fire gases. The following example shows the application of the proposed method. An examination one morning of the chimney gases from a stove, with a temperature of 221° C., gave 7·8 per cent. of CO_2. The temperature of the atmosphere was 6° C. The loss of heat by the smoke gases would therefore be $X = 1{\cdot}854\ (221-6) \times 0{\cdot}43 + 1{\cdot}854\ (221-6)\ \frac{100-7{\cdot}8}{7{\cdot}8} \times 0{\cdot}31 = 1635$ calories, or $\frac{100 \times 1635}{8080} = 20{\cdot}2$ per cent. In the afternoon the same furnace showed in the chimney an average of 3·7 per cent. of CO_2 with a temperature of 178° C.; the air temperature being 8° C. Then the working would be, $X = 1{\cdot}854\ (178-8) \times 0{\cdot}43 + 1{\cdot}854\ (178-8)\ \frac{100-3{\cdot}7}{3{\cdot}7} \times 0{\cdot}31 = 2676$ calories, or $\frac{100 \times 2676}{8080} = 33{\cdot}1$ per cent. of loss through the chimney.

A Pipe-Bending Machine.

A valuable machine for gas-fitters, plumbers, &c., is announced in the American technical journals. This is a pipe bending and coiling machine, the property of the United States Pipe Bending and Coiling Company, of Chicago. The apparatus, as illustrated and described, appears to consist mainly of a central grooved roller, working on the inside of the bend, and smaller grooved rollers working on the outside to press the pipe into the required shape. The pipe is held in tongs, and is bent, coiled, or coned to any desired form without either heating or filling, it being declared to be improved in strength by the operation. The same machine takes either heavy wrought-iron or the lightest brass and copper pipe. It turns out any number of a particular coil, as regards diameter and spacing of the terms, at the rate of 3 feet per minute. The machine is simple in construction, consisting of a very few strongly-made parts. With its use there is no scale formed in the inside of the pipe, which is always the accompaniment of hot bending; and with brass or copper pipe no refinishing is required after the tube has passed through the machine. Any length of tube can be coiled or bent, at any part; the capacity of the machine in this respect being limited only by the space in which it is worked and the length of pipe that can be supplied. The Company intend to manufacture and lease the machines to users. Worked in combination with an electric welding apparatus, which will unite pipe of any material in an endless line, this machine is expected to open up a fresh field to the tube worker.

Portland Cement Tests.

A report has been submitted by M. le Chatelier to the Société d' Encouragement on a paper by M. Candlot on Portland cement. The author's chief object was to examine the various existing methods of testing cement, which embrace determinations of chemical composition, fineness, density, time of setting, and tensile strength. Taking these *seriatim*, it is found that the ultimate composition of cement may vary within tolerably wide limits without constituting any indication of its quality. The only points that appear to be of use in this regard are the proportion of insoluble matter, which in a good cement is not above 1 per cent.; the loss on ignition (water and carbonic acid), which if exceeding 3 per cent., indicates that the cement is appreciably affected in strength; and the presence of sulphides in notable amount, which means adulteration with blast-furnace slag. M. Candlot considers, in connection with tests for fineness, that all particles which will not pass through a sieve of 900 meshes per square centimetre are inert. Considering how greatly the weight of cement is affected by its fineness, M. Candlot does not attach much importance to density determinations. Speed of setting is also so easily affected by comparatively slight causes, that it is of little value as an indication of the quality of a sample. Compression tests approach more nearly than those in tension to the conditions of practical use; but are little used on account of their difficulty and the costliness of the necessary apparatus. Cement does not attain its maximum strength for a year after mixing; and it is M. Candlot's opinion that the usual short-date tests only give an imperfect idea of the final strength of the cement. It has been proposed to supplement the ordinary tests by hardening the briquettes in water at or about boiling point, but M. Candlot condemns the idea. M. le Chatelier, however, thinks it would be useful as tending to reveal excess of lime. On the whole, the conclusion of the paper is unfavourable to the existing methods of testing, and reforms are declared necessary, without, however, any precise indications of the direction these should take.

Communicated Article.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

XXVIII.

Some particulars of the composition of carburetted water gas as supplied to the public in America, have already been given; and it will be convenient at this point to exemplify the composition of uncarburetted water gas as actually obtained in practice on a working scale. Although such gas is not luminous in the ordinary sense of the term, yet attempts have been made to render it so by the aid of incandescent burners. For this reason, it may be included as a part of our subject. In the table on the next page, Nos. 1 to 10 represent samples of gas manufactured by the "Strong" apparatus. No. 12 is from Greene's report on water gas, drawn up for the Franklin Institute of Philadelphia, and was taken from a Lowe apparatus. The average composition of the gas obtained in regular daily working with Pintsch's apparatus at Essen is shown by No. 13. No. 14 is from a paper published in the last volume of the Transactions of the American Institute of Mining Engineers.

The practical information afforded by the table will be better understood after consideration of some few experimental researches on the subject. Dr. Bunte gave the results of some experiments with the "Strong" apparatus at the 1880 meeting of the German Association of Gas and Water Works Engineers.* He worked with much shorter "runs" than the period advocated by other engineers; the whole occupying only ten minutes, of which six were occupied in blowing up, and four in making gas. Probably the reason of this was that, from the commencement of each run, he found the gas to deteriorate rapidly. In no case did he secure the absence of carbonic acid; and the proportion present increased rapidly, as shown by the following tests:—

	1st Min.	2nd Min.	3rd Min.	4th Min.
1 . . .	6·0	9·0	12·2	14·1
2 . . .	5·0	9·5	—	13·5

These figures represent the proportion of carbonic acid that was present in samples of the gas taken at one minute intervals from the time of commencing. The average composition of the gas is given in No. 10. To the frequent changes is attributed the presence of so much nitrogen—viz., 7·5 per cent. At the expiration of each blowing up, the regenerators would be full of producer gas; and this would pass backward through the furnace and eventually into the water-gas holder. The production was very rapid; 735 cubic feet being evolved at each run, or a total of 87,500 cubic feet per day.

Whatever method is adopted for working the system of alternate blowing up and gas making, it appears difficult to avoid the mixing of a certain amount of air and producer gas with the water gas. The regenerator, furnace, and connections must be filled with producer gas or with air at the beginning of each gas-making operation

See Journal, Vol. XXXVIII., p. 633.

Carbonaceous Material.	Authority.	Per Cent. by Volume.						
		Hydrogen.	Light Carb. Hydrogen.	Carbonic Oxide.	Carbonic Acid.	Nitrogen.	Oxygen.	Air.
1. American anthracite	Professor Moore	52·76	4·11	35·38	2·05	4·43	0·77	—
2. " "	Vanderweyde	52·30	4·30	39·40	1·40	—	—	2·60
3. " "	Würtz	49·60	5·50	40·80	1·10	—	—	2·70
4. English oven coke	Sarnström	55·00		40·00	4·00	—	—	1·00
5. Swedish bituminous coal	"	59·50		34·80	2·60	—	—	3·00
6. Welch anthracite	"	61·30		31·10	3·60	—	—	1·00
7. One part coke; 3 parts dry peat	"	57·00		35·50	7·00	—	—	0·50
8. " " 3 " wet "	"	57·10		33·40	9·00	—	—	0·50
9. " " 3 " Newcastle	"	57·20		35·00	6·80	—	—	0·70
10. Cannel coke dust	Dr. Bunte	50·00		34·50	7·30	7·50	—	0·70
11. ——	Langlois	49·62	2·17	42·21	6·00	—	—	—
12. Anthracite	Green	44·50	—	42·10	3·60	—	—	—
13. Coke	Fischer	48·60	0·40	44·00	3·30	—	—	3·70
14. ——	Jacobus	52·88	2·16	36·80	3·47	4·69	—	—

and this must either be displaced, with the loss of a part of the first-formed water gas, or allowed to mix with the same. Bearing this in mind, it is difficult to understand how it is possible to make gas containing such small quantities of nitrogen as that shown by Nos. 4, 6, 7, and 8; and this suggests the suspicion that the large quantities of hydrogen and marsh gas given in Nos. 4 to 9 —a larger proportion than that afforded by other analyses—also include the nitrogen.

The conditions which lead to the formation of carbonic oxide, when air or steam is blown through red-hot coke (carbon), although apparently simple, are in some respects obscure. According to some of the best authorities, 1 lb. of carbon in burning to carbonic oxide, liberates 4500 units of heat; or if burnt to carbonic anhydride, 14,500 units. If the carbonic oxide is burnt to carbonic anhydride, we get 14,500 − 4500 = 10,000 units. Or, if carbonic anhydride is decomposed, with the formation of carbonic oxide, 10,000 units of heat are absorbed.

If we force an air blast through incandescent coke, the first result is that carbonic anhydride is formed, with the liberation of a large quantity of heat—about 14,500 units per pound of carbon decomposed. Assuming that after this reaction there is a sufficient body of carbon for the resulting gases to pass through, the carbonic anhydride is decomposed, with the absorption of 10,000 units of heat. One pound of carbon would combine with 1⅓ lbs. of oxygen to form 2⅓ lbs. of carbonic oxide. But the 1⅓ lbs. of oxygen would be also attended by rather less than 4½ lbs. of nitrogen. Assuming that the 14,500 − 10,000 = 4500 units of heat were absorbed by the resulting gases, their temperature would be raised to the extent of more than 20,000°. In practice, however, some of it would be taken up by the carbon, the sides of the furnace, &c. But it is easy to see that with this continual generation of heat, the process is self-acting, and may be maintained for as long a period as required, by keeping up a proper supply of carbon and air. Indeed, there will be an excess of heat; and the gases will leave the generator at a high temperature. The bulk of the gases at 60° Fahr. will be rather more than 90 cubic feet for each pound of carbon decomposed.

But if instead of air we use steam, a different order of operations occurs. One pound of carbon requires for its decomposition into carbonic oxide, 1⅓ lbs. of steam. But the steam, as such, is of no use. It must first be decomposed into its elements—1⅓ lbs. of oxygen and ⅓ lb. of hydrogen. To effect this a certain amount of heat must be absorbed or rendered latent. One pound of hydrogen, burnt to water, yields 62,500 units of heat. It can obviously be burnt, and then reproduced by decomposition of the resulting steam, any number of times. At each decomposition of the steam, a quantity of heat exactly similar to that given out on combustion is absorbed. In the course of decomposition into its elements 1⅓ lbs. of water will therefore absorb 62,500 ÷ 6 = 10,416 units of heat. If we admit the water in the form of steam, a part of this heat has already been supplied to it—say, 152 × 1⅓ units to raise it to boiling point, and 997 × 1⅓ units to convert it into steam—a total of 1723 units. Assuming the steam to be admitted at 212°, the quantity of heat required will be 10,416 − 1723 = 8693 units. Towards this quantity, 4500 units will be supplied by the formation of carbonic oxide as above explained; leaving a deficit of nearly 4200 units. In practice, a greater quantity of heat must be supplied, because the gases escape at a high temperature. This is unavoidable on account of the fact that the generator and its contents must be maintained at bright-red heat, so as to secure the decomposition of the steam and the formation of carbonic oxide.

On account of this absorbtion of heat during the manufacture of water gas, the process is attended with a gradual reduction in the temperature of the generator and its contents; and hence the necessity for working intermittently. It is necessary to pause at frequent intervals, for the purpose of getting up the heat. And there is also the disadvantage that if the temperature falls below a certain limit, the water gas is impure, being charged with quantities of undecomposed steam and carbonic acid. So in practice it is the rule to develop as high a temperature as possible in the generator, either by the manufacture of producer gas, or, if this is not required, by the complete combustion of a portion of the fuel to carbonic acid.

The bulk of water gas produced by the decomposition of 1 lb. of carbon, is about 61 cubic feet at 600° Fahr. To produce this quantity of gas, 4200 units of heat are absorbed; or (say) 70 units per cubic foot of gas. As we have seen, as much as 10,000 cubic feet of water gas are sometimes formed at one run, which would mean the absorption of 700,000 units of heat, besides that used for the generation of the steam. The specific heat of coke at ordinary temperatures is 0·2; but the specific heat increases as the temperature rises. If we assume it to be doubled at incandescent temperatures, we arrive at the factor 0·4 for working upon. Further, assuming the generator to contain 1000 lbs. of coke, it will be seen that each increase or decrease in temperature means a gain or loss of 400 units. So that in order to form anything like the above quantity of gas per run, either a very high temperature or a large generator would be necessary. For the purpose of roughly exemplifying the working, let us assume that the *minimum* temperature necessary for the production of pure water gas is 1800°; and that the maximum temperature obtainable in the generator by the air blast is 2500°. Assuming that the generator contains 1000 lbs. of fuel, we have then an excess of heat available for making water gas of (2500 − 1800) × 1000 × 0·4 = 280,000 units. This quantity of heat would be equal to the production of 4000 cubic feet of water gas. If we depended upon the producer gas for its generation, we should have to make about 5600 cubic feet of that mixture for each 4000 cubic feet of water gas; or if we prefer to burn the fuel completely to carbonic anhydride, about 20 lbs. must be used between each run.

In these calculations it is assumed that the whole of the heat—including that carried off by the gas—is utilized. In practice, some advance towards this result is made, by applying the hot gas to the heating of the water or the steam supplied to the generator. It fortunately happens that the specific heat of steam is high—0·475 at ordinary temperatures—so it can be made the means of conveying considerable quantities of heat to the generator. If we "superheat" the steam to 700°, we thus convey (700—212) × 1·5 × ·475 =348 units of heat; or allowing for the increased specific heat at higher temperatures, we may say 400 units—*i.e.*, or nearly 10 per cent. of the total heat required. In a similar manner, the air supply for the producer gas, or the combustion necessary in heating up, may be heated by means of the effluent gases, or, if preferred, by other means.

The heat generated in the production of 5600 cubic feet of producer gas is about equal to that absorbed in the production of 4000 cubic feet of water gas. The two gases might be mixed after generation, so as to form a mixture consisting of 30·5 cubic feet of hydrogen, 60 cubic feet of carbonic oxide, and 60 cubic feet of nitrogen. But the same result may be obtained in a simpler way, by admitting a mixture of air and steam in proper proportions to the generator. In this case there will be neither loss nor gain of heat; and therefore the process can go on continuously. The high proportion of nitrogen renders this mixture unfit for carburetting, or conversion into illuminating gas; but it can be used as a heating gas, and as such has been put before the public under various special titles.

In the "Lowe" process, as we have seen, the producer gas is burned in the superheaters, and so made to do duty in the way of producing water gas. Various other methods of securing the return of as much of the heat as possible to the generator, have also been tried. Or, in some cases, the producer gas may be collected and applied as a fuel to the heating of boilers, &c.

Change of Address.—The offices of the Monte Video Gas Company, Limited, have been removed from 103, Gresham House, Old Broad Street, to Suffolk House, Laurence Pountney Hill, Cannon Street, E.C.

Death of Mr. Cyrus Legg.—We regret to announce the death, at his residence, Rochfort Tower, South Norwood, of Mr. Cyrus Legg, J.P. The deceased gentleman was a shareholder of the late Phœnix Gas Company, and was a frequent attendant at the meetings. He was for about eighteen years a member of the Metropolitan Board of Works. Mr. Legg had been in failing health for some time before his death, which took place on the 19th inst., in his 77th year.

Technical Record.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Half-Yearly Meeting of this Association was held last Wednesday, at the Guildhall, Ipswich, under the presidency of Mr. W. Barratt, of Grantham. The weather was propitious; and the members and friends assembled in good numbers. Owing to the many items of business and pleasure, which the Committee (with the co-operation of Mr. J. T. Jolliffe, the Engineer of the Ipswich Gas-Works) had compressed into the day, the business had to commence punctually at the early hour of eleven.

An Official Reception.

On the President taking the chair,

Mr. Sterling Westhorp, the Chairman of the Ipswich Gaslight Company, offered the members a sincere welcome to the ancient town, and expressed the hope that the deliberations of the day might be successful and productive of much good, and that fine weather would prevail.

The President thanked Mr. Westhorp for the kind way in which he had introduced himself to the members, and welcomed them to Ipswich. With regard to the Association, he thought that every member would try to do his duty that day—not only those who read papers, but those who discussed them, so that the benefit of the Association meeting in Ipswich might be mutual—that both the members and the Company might be benefited; and he was quite sure the Chairman and Directors would have no cause to repent the visit of the members.

The Minutes.

The Honorary Secretary (Mr. H. Wimhurst, of Sleaford) then read the minutes of the last meeting, which were confirmed.

Election of New Members.

The President said the next business was the election of new members; and he had great pleasure in recommending for approval the names of four gentlemen—Mr. J. Ayris, of Lowestoft; Mr. Alex. Mitchell, of Bury St. Edmunds; Mr. F. E. Buckle, of Woodbridge; and Mr. C. F. Parker, of Beccles.

The recommendation was formally agreed to.

The Secondary Air Supply to Ordinary Retort-Settings.

Mr. W. J. Best (St. Ives) read a short paper on this subject; but owing to the engraving illustrating the author's plan of admitting the secondary air supply not being ready in time for this week's Journal, we shall give the paper and discussion in our next issue.

Some Reflections upon the Commercial Policy of a Gas Undertaking.

Mr. J. Carter (Lincoln) next read a paper bearing the above title. It appears elsewhere to-day, p. 600.

A Simple Breeze Furnace.

The President said that this brought them to the end of the papers; but they had had forwarded to them a brief description of a simple breeze or dust furnace. As this was only received that morning, as their time was limited, and as the writer—Mr. Drewry, of Cleethorpes—proposed to read a paper at the next meeting, perhaps the members would take it as read.

Mr. Jolliffe proposed that the paper be taken as read; and this was agreed to.

Election of Office-Bearers.

The President said that the Vice-President was Mr. Barton, of Peterborough; and it was proposed by the Committee that he should be President for the incoming year, and that Mr. Carter should be Vice-President.

Mr. Best formally proposed the election of Mr. Barton; remarking that he did not think a more suitable gentleman could be found for the office.

Mr. Jolliffe seconded the proposition, which was agreed to.

Mr. A. Mead (Chelmsford) moved the election of Mr. Carter as Vice-President.

Mr. F. Weller (Yarmouth) seconded the motion; and it was at once carried.

The President said the next business was the re-appointment of the Honorary Secretary and Treasurer. He referred to the immense amount of labour which Mr. Wimhurst had had to perform, and spoke in commendatory terms of the way in which he had carried out the work.

Mr. Carter proposed the re-election of Mr. Wimhurst, and congratulated him upon the success of the meeting. The bulk of the work of organizing the Association had fallen upon their Secretary; and he had done it as though it had been a matter of personal interest to him.

Mr. T. Greaves (Melton Mowbray) seconded the proposition, which was agreed to.

The President moved the election of Messrs. Arthur Mead, C. E. Jones, and R. J. Sharman as members of the Committee, in place of those retiring.

Mr. E. J. Brockway (Oakham) seconded the motion, which was carried unanimously.

On the proposal of Mr. Sharman, seconded by Mr. C. Grimwood (Sudbury), Messrs. Weller and Yorston were re-elected Auditors.

Place of Next Meeting.

The President said that, as Mr. Barton would be the President for the year, it would, he thought, be desirable to have the next meeting at Peterborough.

Mr. Mitchell moved, and Mr. Weller seconded, that the spring meeting of the Association be held at Peterborough; and the members, without discussion, concurred in the motion.

Votes of Thanks.

Mr. Mead, in a few well-chosen words, moved a vote of thanks to the President for the manner in which he had conducted the affairs of the Association during his year of office.

Mr. Jolliffe seconded the proposal.

The President having briefly responded,

On the motion of Mr. Mitchell, seconded by Mr. W. Wells (Stamford),

The thanks of the members were accorded to the Vice-President and the Committee for the part they had taken in carrying on the work of the Association during the year.

The Vice-President (Mr. J. Barton, of Peterborough) having responded,

The President proposed a vote of thanks to Messrs. Best and Carter for the papers they had read.

Mr. Greaves seconded the proposal, which was heartily agreed to.

The President said that, before they separated, they ought to acknowledge the kindness of the Mayor (Mr. J. H. Josselyn) for allowing them to use the library of the Guildhall. The beautiful place in which they were assembled had contributed greatly to the success of the meeting. He moved accordingly.

The Vice-President seconded the motion, which was carried with acclamation.

This concluded the business part of the proceedings.

Visit to the Gas-Works.

Vehicles were waiting outside the Guildhall to convey the members and their friends to the gas-works. On arriving there, the party found that the Directors had kindly provided a liberal supply of refreshments in the offices. Having lingered here for a while, the company inspected the works; being accompanied by Mr. Jolliffe and his assistant (Mr. F. Prentice). Though the major part of the plant cannot be said to be of the most modern type, yet the Engineer can boast that he has ample capacity in every particular for the demands made upon him. Passing first through the two retort-houses, it was seen that each contained 132 retorts set in beds of sixes—the bottom retorts being throughs, and the upper ones singles. In the first house, some of the visitors intently watched the operations of one of West's coal-breaking machines with an arrangement for conveying broken coal to a hopper at the top, from which a hand-stoking machine is fed. Mr. Jolliffe is well situated for obtaining his raw and other materials by water carriage; the works being situated on the banks of the River Orwell. On his landing-stage he has a hydraulic crane, by the aid of which he can lift from the barges and deposit in the coal-store, by means of trollies running on rails, no less than 600 tons of coal in twenty hours, and this work has, when time pressed, been accomplished in seventeen hours. There are two Livesey washers in use, and two tower-scrubbers—one Mann and Walker's, and the other Dempster's; both being about 80 feet high. The purifier-house was visited by some of the members, and then the exhauster-house, where one of Gwynne and Beale's exhausters was in operation; and in this building the pumping-engine for the hydraulic crane is also situated. There are two gasholders—both two-lift; in one case the tank is above, and in the other below ground. Perhaps the most interesting portion of the plant—especially to those who represented small works—was Feldmann's apparatus for the manufacture of sulphate of ammonia, which has been installed at Ipswich for about a twelvemonth. Mr. Jolliffe uses pyrites acid in the manufacture. It was noted by many that the colour of the product was not very good; but Mr. Jolliffe explained that this could be easily overcome by making a slight alteration in the method of working. However, the colour is not a matter of great importance, inasmuch as Mr. Jolliffe is happily able to dispose locally of the sulphate produced for the manufacture of artificial manure.

A Trip Down the Orwell.

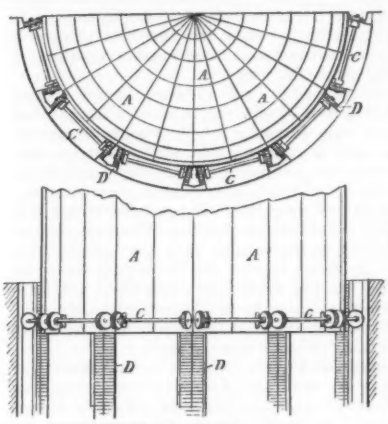
Having completed their circuit of the works, the party wended their way down to the point from which the Great Eastern steamboats start which ply between Ipswich, Harwich, and Felixstowe. Having embarked on one of the boats, it was soon on its way down the Orwell, which is considered to be one of the prettiest of the rivers on the east coast. After about an hour's ride, Harwich was reached; and having touched there, the boat crossed the fine harbour to Felixstowe, where the members landed. The journey back to Ipswich was made by rail.

The Dinner.

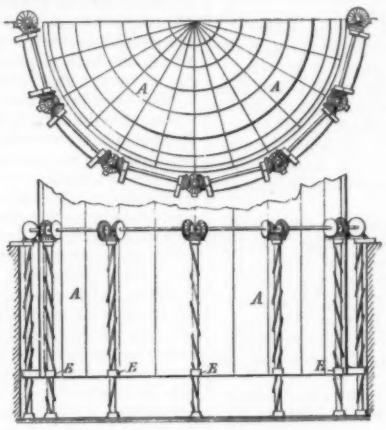
At six o'clock the members and friends assembled at the Guildhall, where, at the kind invitation of the Directors of the Gas Company, they sat down to a sumptuous dinner. Mr. Sterling Westhorp, the Chairman of the Company, presided, and was supported on his right by the President of the Association, and on his left by the Mayor of Ipswich (Mr. J. H. Josselyn). At the close of the repast, a number of toasts were proposed and duly honoured; among them being "Success to the Eastern Counties Association of Gas Engineers," "The Ipswich Gas Company," and "Kindred Associations."

GADD AND MASON'S IMPROVEMENTS IN THE CONSTRUCTION OF GASHOLDERS.

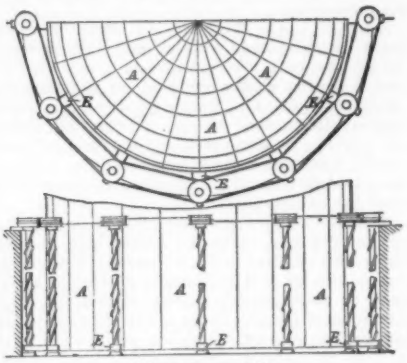
We learn that the specification of Messrs. Gadd and Mason's second patent, entitled "Improvements relating to the Construction of Gasholders," has now been accepted by the authorities; and we are thus enabled (by the courtesy of Mr. Gadd) to lay full particulars thereof before our readers to-day, together with reduced illustrations prepared from the drawings which accompanied the specification. Mr. Gadd's first patent was fully described and illustrated in the JOURNAL for Sept. 18 last year; and it is proposed—in view of the general interest attaching to the question of gasholder construction—to reproduce, practically in the inventors' own words, the whole of the description they have filed with the Patent Office authorities in regard to their later arrangements. The application for the patent, it should be mentioned, was dated Dec. 12, 1888; No. 18,119.



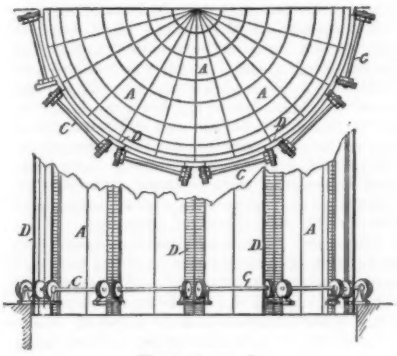
FIGS. 1 AND 2.



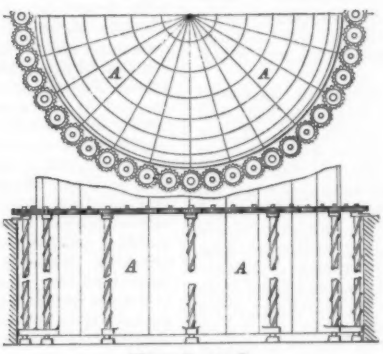
FIGS. 5 AND 6.



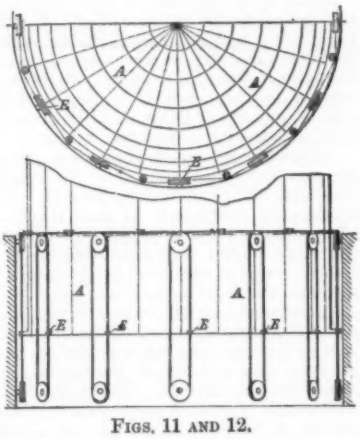
FIGS. 9 AND 10.



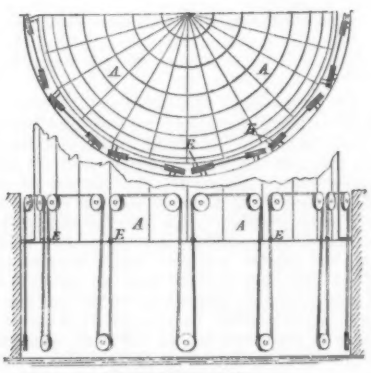
FIGS. 3 AND 4.



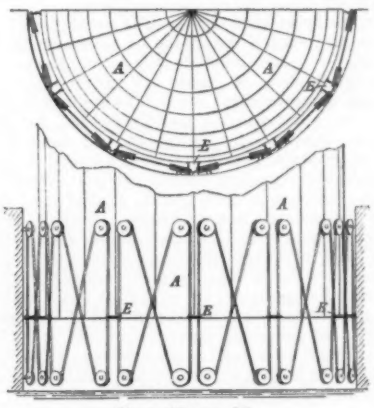
FIGS. 7 AND 8.



FIGS. 11 AND 12.



FIGS. 13 AND 14.



FIGS. 15 AND 16.

These improvements have for their object the supporting of gasholders in their working position in such a manner as to enable the external or upper guide-framing hitherto employed for that purpose to be dispensed with, and yet to give the requisite stability, although such, or a modified form of framing, may be employed in connection with these improvements when desired.

To accomplish this object, it is proposed to fix round the face of the tank or well a series of vertical guides, constructed in the form of racks, or mechanical equivalents therefor—such as vertical screw-shafts of coarse or quick thread, or vertical endless chains or bands passing over and between pulleys or wheels at or near the top and the bottom of the tank or holder, as the case may be. At corresponding intervals round the lower curb or ring of the holder, there are mounted on suitable shafts or studs, pinion mitre, or other toothed wheels or mechanical equivalents therefor—such as notched wheels, or in some cases plain wheels or pulleys—which gear into or with the racks or equivalents aforesaid. These wheels are, by preference, all likewise geared together in such manner that, when one is caused to turn, the whole will turn therewith and to the same extent. By these means, if the holder carrying or connected with these geared-up wheels moves upwards or downwards, it will be sustained in the same relative position at all heights. The like result is also obtained by fixing the vertical racks or equivalents to the outer face of the holder; and the pinion, mitre, or other wheels, round the top of the tank. In like manner, the method may be extended to telescopic holders. The wheels which take into the guides may be geared together either by shafts, intermediate between, and turning in suitable journals; by means of intermediate wheels in train; or by a plain chain or rope, or link-chain gearing. And, instead of the whole of the wheels being geared together, portions only may be geared as a modification.

Other variations in detail may be made, say the patentees, without departing from the peculiar character of the invention, which consists in connecting, by means of torsional or tensional gearing, a number of points round the bottom curb of a gasholder in such a manner that, when one point thereof tends to rise or fall, the same tendency is transmitted through such gearing round the circle to every other point.

Fig. 1 shows a plan view, and fig. 2, a sectional elevation of one arrangement of the improvements applied by means of spur-wheel and shaft-gearing attached to the holder; while fig. 3 shows a plan view, and fig. 4, a sectional elevation of the same application attached to the tank wall. The racks and pinions may also be

connected by chain gearing, by tangential pinions or angular geared wheels, or by a train of tangential wheels geared together round the holder. Fig. 5 shows a plan view, and fig. 6, a sectional elevation of another arrangement of the improvements applied by means of vertical screws as mechanical equivalents of rack gearing; while figs. 7 and 9 show plan views, and figs. 8 and 10 sectional elevations of the same with horizontal wheel, and horizontal wheel and chain gearing. Figs. 11, 13, and 15 show plan views; and figs. 12, 14, and 16, sectional elevations as examples of modes of applying chain or tension gearing (which may be link chain, plain chain, or wire rope) in accordance with these improvements.

In figs. 1 and 2, C are the shafts mounted on the holder A, carrying the toothed wheels; and D the racks arranged at intervals round the tank. In figs. 3 and 4, the arrangement is reversed; and C are the shafts mounted on the tank wall, while D are the racks attached to, or forming part of, the holder. In figs. 5 and 6, the bevilled toothed wheels and shafting, forming part of the ring of gearing, is completed by the vertical quick-threaded screw-shafts, actuating a short screw-rack, or screw-socket E, which, in the example shown, are attached at intervals round the holder or near the bottom curb.

But this form of gearing also may be either attached (as shown) to the tank wall, or to the holder side in reverse. Figs. 7 and 8 show this variety with horizontal wheels geared in train. In figs. 9 and 10 part link-chain gearing is shown, and part screw-rack or shaft gearing; while in figs. 11, 12, 13, 14, 15, and 16, examples of gearing by means of plain chain, or wire, or other rope gearing with plain wheels or pulleys are shown. Combinations of two or more of these varieties may, however, be employed, if desired.

When the plain chain or rope gearing is attached to the holder, the vertical chains are connected at suitable points, as at E, to the tank side; while if the chain or rope gearing is fixed to the tank wall, the chains are attached at suitable points, as at E, to the bottom curb of the holder. Suitable devices for tightening the tension gearing may be employed, by raising or lowering the wheels, or some of them, as will be readily understood, and which it is not considered necessary to show.

It will be obvious, the patentees remark, that other varieties of arrangements of gearing may be employed, both torsional and tensional, and combinations thereof, which, like those shown, are mechanical equivalents of each other; the object and operation of all of them being to gear the different actuating points round the circle of the holder together, in such manner that when the holder, carrying or carried by the geared wheels—whether toothed or plain, and fixed at intervals round the circle—moves upwards or downwards, it will be sustained in the same relative position at all heights. The ring of gearing, whether torsional or tensional, may be complete or partial, or in sections; and the wheels may be arranged either tangentially, radially, or in any angle which may be desired. The tank and holder may be (and are by preference to ensure easy working) fitted with rollers and plain guides, in addition to the gearing shown and described, without departing from the peculiar character of the invention.

The claims made by the patentees are: 1.—The employment of torsional gearing arranged round a gasholder or gasholder tank, which gearing connects or gears together points upon and at intervals around such holder, so that the point moving upwards or downwards communicates through such gearing the tendency of motion to the other points round the holder, for the purpose and in manner substantially as shown and described. 2.—The employment of tensional gearing arranged round a gasholder or gasholder tank, which gearing connects or gears together points upon and at intervals around such holder, so that one point moving upwards or downwards communicates through such gearing the tendency of motion to the other points round the holder, for the purpose and in manner substantially as shown and described. 3.—The employment of torsional and tensional gearing combined, arranged round a gasholder or gasholder tank, which gearing connects or gears together points upon and at intervals around such holder, so that one point moving upwards or downwards communicates through such gearing the tendency of motion to the other points round the holder, for the purpose and in manner substantially as shown and described.

A New Atmospheric Gas-Burner.—A new atmospheric gas-burner, the invention of Mr. H. Cox, has lately been on view at the offices of Messrs. Terraneaux, in Pall Mall. It consists of a short tube having at its base an ordinary tap for the admission of the gas. Openings are cut in the tube, within which is another close-fitting pipe with corresponding openings in it. The inner tube is moved partially round by means of a connection with the gas-tap, so that when the gas is turned off the openings in the outer tube are covered by the unpierced portions of the inner tube, which thus acts as a revolving shutter. When the gas is turned on, however, the openings become gradually uncovered, and the air is admitted in the exact proportion required for the amount of gas entering from the tap. The gas and air are blended in the tube before they enter the burner, which is mounted on the tube. It is claimed for this burner that by its use perfect combustion is ensured, and great heat obtained from the flame (which is of a deep blue colour), with a very small consumption of gas; also that it enables a gas-stove to be used in a room without a flue, and with great economy as regards the cost of heating and cooking.

THE COMMERCIAL POLICY OF GAS UNDERTAKINGS.

By John Carter, of Lincoln.

[A Paper read before the Eastern Counties Gas Managers' Association, Ipswich, Sept. 18, with the discussion thereon.]

The industry with which we are connected, in its commercial aspects, is receiving in these days more attention, and is the subject of thought to a greater extent than was formerly the case. Gas engineers and managers are discussing matters of business policy as well as the subjects of a technical character. This is a hopeful sign. A sound commercial policy is a necessity to the full development and success of any business undertaking, and to the gas industry no less than others. And in these days, when the spirit of competition is abroad, it is a matter of great importance that we should carefully inquire as to what are the best principles which can be applied; and having determined upon them, then, as far as we are able, secure their adoption.

The lines to be laid down for the conduct of our business must necessarily be largely influenced by the competition that gas has to encounter. I need not stop to make any reference to electric lighting as a competitor with us, beyond this, that it is never wise to despise a rival, and even the presence of electricity amongst us as a lighting agent will do us no harm if it quickens our energies, and leads us to the adoption of principles of business which will establish gas more firmly in the public favour. The only competition which comes into close quarters with us is that arising from the use of petroleum. In some towns this is keenly felt. In Lincoln, with gas at 2s. 6d. per 1000 cubic feet, there are from 2000 to 3000 houses where petroleum, or illuminants other than gas, are used. And I do not suppose that this proportion is greater than, nor as great as, obtains in some other places.

Now, the important question to every one of us is, What is the line of conduct to pursue in the face of these circumstances, in order that we may maintain the pre-eminence of gas as an illuminant, and extend its use still further? I cannot improve upon the suggestion made by a gentleman whose name is always received with favour in a gathering of gas managers; I refer to Mr. Thomas Newbigging. He stated, as the points at which gas managers should aim, cheapness, lighting power, purity, and the removal of every hindrance which stands in the way of the more extended use of gas for lighting and cooking purposes. If we can succeed in the attainment of such objects as these, we shall do much, probably all that is necessary to the full development of the business with which we are all associated. With regard to cheapness, there are many things in connection with the manufacture of gas which affect the selling price—the careful selection and purchase of coal; the best and most economical methods of carbonization; the most profitable means of disposing of the residual products—all have an important bearing upon this question. There is one other factor in the case, and not the least important—viz., the annual charges for dividend and interest. It is not too much to say that the capital charges have in all cases a great deal to do with the price charged, and in some it is the determining factor. I have here a few interesting figures upon this point, most of them relating to gas undertakings in the district covered by this Association, and showing what proportion of the selling price of gas is absorbed by the annual charges on account of capital.

1.	Capital charges per 1000 cubic feet	. . . . .	10·00d.
2.	"	"	10·77
3.	"	"	14·26
4.	"	"	18·46
5.	"	"	19·16

It will be observed that between the highest and the lowest of these there is a difference of no less than 10d. per 1000 cubic feet, or nearly so; and this means, other conditions being equal, that in one case gas can be sold at 10d. per 1000 cubic feet less than in the other, where the capital charges are so much heavier. The moral of these facts then is, keep the capital account down to the lowest point possible. The cost of absolutely new works extensions, properly so-called, are of course legitimately chargeable against the capital account; but it may be the case that expenditure of this class has not been so carefully watched as it would be if it immediately affected the profit and loss balance. We shall do well to remember that every £100 spent upon this account imposes a perpetual tax of £6 or £7 per year, according to circumstances, upon the undertaking. Heavy capital charges render cheap gas an impossibility. A manager who has to pay 19d. or 20d. per 1000 cubic feet away in shareholders' dividends has a heavy burden to carry; and however attentive to, and skilful in his business he may be, the result of each year's work is to a great extent spoiled.

There is another point in connection with this matter. In raising new capital as required, why should not gas undertakings take advantage of the cheapness of money, as other commercial concerns do, and obtain a larger proportion than now is the case in the way of debenture or other stock at a low rate of interest? There should be no difficulty in the way considering the security which we can offer. Gas capitalists may reasonably be expected to recognize the altered condition of the money market, and be satisfied with 4 or 4½ instead of 6 or 7 per cent. as formerly. This would all tend in the direction of cheap gas.

The advantages accruing from a low selling price are obvious enough to all. It generally means a growth in consumption, and affords a manager an opportunity of extending his business as no other circumstance will. This is general experience. One necessary feature of our policy, then, is to aim at cheapness. Another is to supply gas of high illuminating power. A parliamentary

standard is by no means the only consideration that should influence us. It may be low, and generally is—in many cases not more than 14 or 15 candles; and although this may be the legal requirement, policy suggests that a higher standard should be attained. It is unwise for any manager to be satisfied so long as he just complies with this modest parliamentary requirement. In that case a low standard becomes a very doubtful advantage. A more liberal policy in this particular is far better. It is not for me to say what should be the lighting power of gas supplied; but I will venture to assert that, with our present knowledge of coal, and our extended experience as to the best means of condensing, cleansing, and purifying, an average photometric power of 16½ to 17 candles should not be beyond our reach, and the quality should be, all things considered, as uniform as possible. In short, our efforts should be directed to satisfy our customers. Of course, we do not expect an immunity from complaint under any circumstances; and we shall probably find that the loudest complaints come from those who have the remedy in their own hands. But in the main, the supply of a good material always yields satisfactory results; and there is no reason to suppose that gas provides an exception. Very much the same remarks will apply on the question of purity. Generally speaking, our customers mean sulphur when they talk of impurity; and probably, even after all the attention which has in recent years been given to the question of the elimination of what are known as the sulphur compounds, in some few cases the complaints are not without just cause. I recollect reading a letter, I think in the JOURNAL OF GAS LIGHTING, in which the writer showed how small a proportion by volume was represented by 40 to 50 grains of the sulphur compounds per 100 cubic feet. But that is not the question. Are the 40 or 50 grains an irreducible quantity? We all know that it is not so. I am acquainted with a gas-works where, some years ago, oxide of iron was the only material used in the purifiers; and the result was gas containing an average of about 40 grains of sulphur. Upon using lime in conjunction with oxide, and still working the same number of purifiers, these compounds were reduced to an average of 16 grains,—and the additional cost was represented by a fraction of 1d. per 1000 cubic feet of gas made. The small additional outlay was well spent in removing the cause for reasonable complaint; and whatever can be done in this direction, it is surely to our interest, commercially considered, to attempt.

There yet remains another question—viz., What is to be done to make gas available to the masses of the people to a greater extent than it now is? This, I think, may be done partly by abolishing what I regard as unwise restrictions, which, in practice, have been placed in the way of its more extended use, in the form of charges for laying services and fees for fixing meters. I would put in all services, irrespective of distance (up to the limit which legally entitles a person to demand a supply of gas), without making any charge whatever, provided there is no private ground to pass through. Meters should be fixed free. I have heard of a company charging a fee of 2s. 6d. for each meter they were asked to supply. I cannot understand such a charge being made. It appears to me to be without reason. I would make a clean sweep of all such charges.

The exaction of deposits from consumers is another practice which should be abandoned. It has been said that, in dealing with the working classes, it is necessary to demand a deposit, as a protection from loss, before giving them a supply of gas. My experience proves that the precaution is altogether unnecessary. In the case of Lincoln, out of a total number of 5500 now in use, 4000 are three-light meters. A large proportion are fixed in the dwellings of the working classes; and we have no customers, speaking generally, who pay their accounts more regularly, or who give us less trouble. It may be safe to require a deposit. There will be some few cases where it will be necessary to do so; but I think it is the wiser policy, and one more conducive to the extension of our business, to abandon the practice altogether, and rely upon a prompt and efficient collection of the accounts.

It is said that the charging of meter-rents is a great hindrance to the extension of business. I am not sure that this is generally the case; and I am not prepared to say that no rent should be imposed. I do not think that the charge, provided it be a reasonable one, is open to objection upon principle; but if I were satisfied that it operated injuriously—that it was generally regarded by the consumers, and by those who might become consumers, as an obnoxious impost—I should not hesitate, as a matter of policy, to advocate its abolition. It is a matter which must, in every case, be determined by local circumstances.

The best means of increasing the facilities for the use of gas, especially in the dwellings of the working classes, is a very important matter to consider. It yet remains to be proved whether this can be effectively done by letting fittings out on hire, or selling them on a system of deferred payment, or by the adoption of a pre-payment meter which will enable gas purveyors to meet, in a more convenient manner than at present, the demands of the smaller consumers. Experiments in this direction will no doubt be observed with interest. In my opinion, the most hopeful feature of our business is the extending use of gas for domestic purposes. How best to encourage and develop this branch of our industry is a matter of sufficient importance to form the subject of a special paper.

I have laid my views before you with some diffidence, partly for the purpose of exciting an interesting and instructive discussion; but mainly because I am firmly convinced that the adoption of principles I have indicated will prove to be the best policy, and will tend to strengthen and consolidate the industry with which we are connected.

Discussion.

The PRESIDENT observed that the paper which Mr. Carter had read was a very important one; and he hoped it would be fairly discussed.

Mr. J. T. JOLLIFFE (Ipswich) said he thought that no one could have listened to the paper which had been read without feeling that it contained matter for very serious reflection to all. Unquestionably the true commercial policy for all gas companies to pursue was to sell a good article at the lowest price; and in doing this, there was no doubt the question of capital came in very largely. The manager who had capital charges amounting to 20d. on each 1000 cubic feet of gas sold was certainly in a most unenviable position; and it should be to his interest to try as far as possible to get the capital account reduced. He could only hope to do this by increased business, which did not seem to be coming to gas companies so rapidly as of yore; nor could it be expected that it would. The field for gas and gas consumption was naturally narrowing. For years they had been trying to spread out in all directions; and they could not hope to go on increasing at the same rate. As to the illuminating power of the gas supplied to their consumers, he considered that "good, honest 16-candle gas" was all that could be desired. If they attempted to supply gas of a higher illuminating power, it resulted in blackened ceilings, especially in such old-fashioned towns as Ipswich, where the rooms of the houses were very low. This brought him to the question of sulphur compounds. If they had 30 to 40 grains of sulphur in the gas burning in a room badly ventilated, and which was very low, the occupants would necessarily feel a great deal of inconvenience; and he considered the point they as gas managers should not lose sight of was that of ventilation. They might depend upon it that the construction of rooms in such a manner that the products of the combustion of gas were carried off, was a matter of some moment to gas men. The Vice-Chairman of the Ipswich Gas Company (Mr. Biddell) was a great enthusiast in this direction; and he was sure that he could give the members some very interesting facts connected with the subject. The price at which gas was supplied was really a most important one. During the last two years his Company had spent several hundred pounds in advertising, distributing pamphlets among the inhabitants, and canvassing—in fact, doing everything that they could think of to increase the number of consumers; but he must say he was disappointed with the result. However, it did not follow that they would not go on advancing. Talking of the general policy of gas companies, he said he should like to draw attention to the fact that the first gas-cooking stove was made in Ipswich. The late Mr. Goddard entered heartily into this matter, and spent a considerable sum of money in experimenting in this direction; and this statement he thought Mr. D. Ford Goddard would corroborate. As to the question of meter-rents, he said he was in favour of them. The tendency of the public was to have a meter fixed, and keep it, whether or not they used gas; and it greatly handicapped a company to have a large amount of capital lying in houses in the shape of meters, when very little use was made of them.

Mr. W. J. BEST (St. Ives) desired to say a word or two respecting the question of meter-rents. He held that it was wise policy to make a charge of this kind, for this reason: If the sum of money that was derived from the meter-rents was given up to the consumers, the companies would have to add something to the price of gas; and this would operate unjustly. Supposing the sum received from meter-rents was equal to 1d. per 1000 cubic feet of gas sold, then, if they abolished the rents, and added the 1d. to the price of gas, the man who burned only 1000 cubic feet per annum would merely have to pay 1d. extra, while the consumer of 100,000 feet would have to pay an additional 8s. 4d. Therefore he advocated adhering to the system of charging a rental for the use of meters.

Mr. G. A. BIDDELL said the paper they had heard was a very admirable one; and it contained matter as much for the consideration of directors as managers. There was so much in it that one could not be expected to run through it generally; but there was a point to which Mr. Jolliffe had referred that he would allude to—that was, the subject of ventilation. The ventilation of rooms was of the greatest importance to the sustenance of gas lighting; but even if lighting by gas was put out, he for one would not be fearful for the progress of gas undertakings. He believed there was a hint in the paper that gas companies should turn their attention to the development of domestic heating by gas; and this touched upon the question of ventilation. Two years ago, he said, he had charge of an invalid; and two physicians who were consulted requested that the temperature of the room occupied by this sick person should be maintained at 60° as near as possible. He (Mr. Biddell) told them that with a coal stove he could not carry this out; but with a gas-stove he would engage to do it within 5° variation. He had two gas-stoves fixed, one of which took the place of the ordinary grate. Owing to the dust, smoke, and so on, a coal fire was a bad thing in an invalid's room. The second stove was employed to heat the necessary supply of air for the proper ventilation of the apartment. The whole arrangement was a perfect success. He obtained from Paris a self-registering thermometer, with indicator cards, which had to be renewed every week. These cards he still had in his possession; and they showed that, for more than nine months, there was not a variation in the room of 5°, while there

was a difference in the temperature outside of from 17° up to 43°. Besides this, no person who entered the room from the fresh air outside ever said it was stuffy. The air of the room was as wholesome the whole of the time—night and day—as the air of any room could be, either with or without a fire. It was a very great encouragement to him and to the members of such Associations as that to know that they had the power and the field for introducing apparatus for heating, which would consume a much larger quantity of gas than was ever used for lighting. Speaking of electricity, he said that, taking it altogether, he regarded it as one of the finest applications of science to the use of mankind that had been made; and even if it succeeded in displacing gas as a lighting medium, gas companies would have plenty to do to keep their works and plant employed. A few weeks since he went to a large provincial hotel in which all the rooms were lighted by electricity; but he noticed that gas-fittings were still in position. Passing into the dining-room, the air appeared to be very vitiated; and he said to a waiter there: "Do you call this ventilation? Why the electric light has not improved it; it was a great deal better than this when you had gas." The man agreed that it was so. He (Mr. Biddell) remarked: "You had better go back to gas." The man said: "We have a gas engineer now who is putting up gas-lights, in order to ventilate the rooms." (Laughter.) A great deal of attention was demanded of gas engineers not only in the production and supply of gas, but in its consumption, and in improving the burners. Whatever they did, greater consideration must be given to ventilation and heating.

Mr. A. Mead (Chelmsford) said he had been struck with the remarks of the author of the paper in regard to the capital of different gas companies. In connection with this matter, he had brought forward some figures relating to the capital charges of companies in the district covered by the Association. These charges ranged from 10d. to 19d. per 1000 cubic feet of gas sold. This he (Mr. Mead) did not think very remarkable. If they looked at "Field's Analysis," it would be seen that some of the companies referred to therein had capitals of from £5 up to £17 per ton of coal carbonized. In some cases this could be readily explained; and the difference in their district between 10d. and 19d. could be easily dealt with. He believed that most of the members would agree that there should be uniformity in the illuminating power of the gas they distributed to the public. Sometimes 17-candle gas was supplied; and then it fell to 14½ candles. If the gas could be supplied without these variations—say, at 15-candle power—it would be much better. With regard to meter-rents, what had been said brought this question to his mind: What would be the position of a manager who was outweighed by the electric light and had to part with some of his best customers, if he did not charge meter-rent? Why he would perhaps have to supply those customers with meters, in order to support their great rival electricity. This was one of the principal arguments for meter-rents. As to ventilation, the gentleman who had last spoken certainly gave some interesting facts. The subject had been considered by many gas engineers. No doubt some of the members had seen the way in which gas-fitters often fixed gas heating-stoves. They would stop the chimney up entirely, with the exception of a small pipe running from the stove; and then if there was any fresh air in the room when the stove was lighted, it soon became vitiated. In his house he had carried tubes for a fresh air supply up to within 6 or 8 inches of the ceiling, and had let talc traps in the chimney for the egress of the impure air. If any of the members would try this plan, they would find that they would have perfect ventilation, as he had. Attention had been called to the fact that the late Mr. Goddard had taken a great deal of interest in gas cooking, and, he might also say, in gas heating-stoves. He (Mr. Mead) had recently come across one of his stoves (he believed it was one of the first introduced), in which the asbestos fibre was laid on a few simple tubes placed at an angle of about 45°. This stove was in use now, and burning beautifully.

Mr. A. Mitchell (Bury St. Edmunds) said that Mr. Carter's paper was one which contained matter for the consideration of directors as well as managers of gas undertakings, because the commercial policy of such concerns was directed by the Board. They could all realize the great difficulty there must be in working under a considerable capital, not only in the case of gas companies but in other concerns. It was greatly to be deplored that the directors of gas companies had not seen it to be their duty, at an earlier date than now, to have done what Mr. Carter suggested—viz., gone in for a much larger percentage of loan capital; and this they could have done at a much lower rate for interest than the dividends they had now to pay on the share capital. The true commercial policy of a gas company was to study their customers quite as much as the shareholders. Their interests ought to be mutual in every respect. Gas companies had a monopoly of gas lighting; but they had not a monopoly of other means of lighting. It would be to their interest to study their customers—even their whims and fancies. Everywhere the petroleum oil difficulty stared them in the face; and it was no use pooh-poohing it. They must endeavour to convince the consumers of the benefits which accrue from using gas as compared with oil. He was sure many people who adopted oil stated that they were satisfied with it when they could not honestly say they were satisfied with a great deal less light than they obtained from gas. Of course, if people were content with 1-40th of the light that they had from gas, then they, as gas managers, must simply content themselves with telling them that they were not enjoying an equal quantity of light. They must let the consumers have a supply of gas as cheaply as possible; and then gas would maintain its level against any other illuminant. He had no doubt that wiser heads than his devised the sliding scale; but he confessed that he wished it had not been introduced. There was no doubt that it had been beneficial in many towns; but where gas companies were doing the best they could for their customers, it did not help to relieve gas managers. It was a great thing to reduce the price of gas 4d. per 1000 cubic feet; and then have to increase the dividend 1 per cent. If it had not been for the sliding scale, there would not have been so much grumbling as to large dividends as there was now, although they were selling gas very much under the standard price; for the public did not care to be troubled with standard prices and all those details. They only wanted gas at a cheap rate; and he wished the dividends had been limited to 10 per cent. But they had the sliding scale; and he supposed they would have to put up with it. As to the charges for the laying of service-pipes and the fixing of meters, he agreed they should not be made; but he could not advocate the abolition of meter-rents. They ought to be reasonable; but they were higher than they ought to be in some cases. As to deposits, each manager must decide that question for himself. It depended entirely upon the kind of customers he had to deal with. Gas companies were not philanthropists. They could not afford to give gas away; and when they did not know who was demanding a supply of gas, they were under the necessity of requiring a deposit. They must do their best to supply a genuine article at a low price for lighting, cooking, heating, and for gas-engines.

Mr. D. Ford Goddard said that one could not but be struck with the wonderful change in the commercial policy of gas companies to-day compared with 30 or 40 years ago; and in this very change might be found some of the reasons why the capital charges of companies in certain instances were so much larger than in others. Undoubtedly the main object of gas companies then was to retain their business, and secure for the shareholders a good dividend; and, secondly, to keep the distribution of further capital amongst those who were privileged to be shareholders. In those days it was a common thing to keep the price of gas up, and extend the works out of profits that were made from the undertakings. Of course, the consequence was that the capital of these companies was very much lower than in the case of companies where everything that was purely chargeable to capital was carried to that account. That was one of the reasons why such great differences were seen. It was unfortunate that it should be so. They could also see a difference in the supply of the general public with gas. It was one thing to sell gas then, when they could get a high price for it; but in these days it was necessary to sell gas at a lower price, in order to have a larger constituency to consume it. But one of these things equalized the other in another way. One of the suggestions in the paper was to let out fittings; but this increased the capital of the company. They were increasing the capital for the purpose of extending the business. But the question was really to resolve whether or not such increase of capital was, however well spent—whether the money was expended in fittings or apparatus which might be let to the public—a good way of increasing the capital account. With regard to the Ipswich Gaslight Company, when his (Mr. Goddard's) father was Manager, gas-fittings were let to the inhabitants to a very great extent; and it was only stopped because of the enormous increase of the capital account which was necessitated by doing so. He did not think that the Company would have been in anything like the position they were now in, if they had not expended this capital, and thus increased the manufacturing account. It was the policy which would have to be adopted; and he believed in a policy which looked to the smaller householders as the best and most continuous constituents of the gas company. That which would bring gas to the masses of the people was a good policy. He did not think they would increase their business by advertising; but they must be prepared to supply apparatus to the people at a very small cost, which they would be willing to pay off in the course of a number of years. The question of meter-rents had been mentioned. He had no objection to these rents; and he thought no real fault could be found with them. If a company charged rent for their meters, they must look to the interests of the public in the use of those meters as fully as they could. This was a matter that had been lost sight of. There were no doubt companies who had systematically charged meter-rents; but had let the instruments get into a bad state of working, and the accounts were made up according to the quantity that was consumed in the corresponding quarter. If gas companies charged meter-rents, they should see that the meters were properly and regularly tested and regulated. He laid that down as the natural outcome of meter-rents. The public should have the best instrument; and they should be shown that it was an accurate machine for measuring their gas. He was glad to hear Mr. Biddell's remarks as to ventilation; for he (Mr. Goddard) regarded it as a very important subject, and one that should be dealt with. He would suggest that the Committee should arrange for a paper on the subject; so that the matter could be properly discussed by the members. It would be to their advantage as gas managers; for they would have to look to heating by means of gas in the future for their increase of business. However, he did not think that the days of gas lighting were over by any means. He believed electric lighting would have a certain sphere; but if they were to sustain gas lighting, they must maintain proper systems of ventilation, or the lighting would break down. He believed in good gas.

Although there had been difficulties in that respect, officers of corporations had taken great pains to discover supposed defects in the quality of the article which gas companies supplied; and the experience of companies was that, after having done their best in order to reduce the price of gas to the lowest possible degree, the next time they had occasion to go to Parliament for increased capital, their standard had been forced down to a still lower point. This was ungenerous; and he believed it would find its remedy in itself. It was their business as gas companies to supply gas as uniform in quality as they could. It was one of the difficulties of sulphur purification that there were times when it would be extremely irregular. It would perhaps one day be down to 4 or 5 grains, and then suddenly it would spring up almost to the verge of the standard, and perhaps a little beyond it, and sometimes it gave great trouble. Their main point was to insist upon a fair standard being given to them in their Acts of Parliament. He thought that in supplying gas of a quality above that which the consumers' burners were adapted for, had done gas companies a great deal of harm. They should see that they supplied an article regular in quality; and gas of 16-candle power was as good as anyone required. One remark made by Mr. Mitchell was extremely *à propos*. He said that when people burnt other kinds of illuminants, they were satisfied with a much smaller quantity of light. They said: "How hot your gas makes the room." And why? Because they were using ten or twelve times more light than if they burned candles or oil; and the result was a great heat. For instance, in a considerable sized room, one would use not less than two burners—say, Sugg's Argand burners, consuming 5 cubic feet of 15-candle gas. There would practically be 30 candles in the room when using both of the lights—each one representing 15 candles; but who would think of putting 15 candles in a room of the size? They would probably be satisfied with half-a-dozen. An advantage of other illuminants was that they were more portable. A person was content with a couple of candles if he could bring them close to the work he was doing; whereas if two brackets were fixed on the wall, and a candle put in each, they would not be of much use. If gas-fittings were made of a more portable nature, people would use them more freely. They would not suffer so much inconvenience; and would be satisfied with the gas bills in the end.

The PRESIDENT said that he believed most of the complaints in regard to blackened ceilings were not at all chargeable to the quality or impurity of the gas; but were simply on account of the burners not being adapted for the quality of the gas. Some persons would have three, four, or five burners in one room, which were adapted for 14-candle gas; while the gas company were delivering gas of 17-candle power. Every gentleman present knew that if gas passed through burners not suited for it, the carbon would be fixed on the ceiling. This was a matter to which they should give a great deal of attention. Unfortunately gas consumers would believe a gas-fitter or plumber before they would anyone connected with the gas company; and if one gave them a little advice, they turned round and said: "You are an interested party; and you want to get money out of our pockets." Gas managers must pay great attention to burners, and advise consumers to use such burners as had been proved to be beyond dispute, if they were adapted for the gas distributed; and if they did this they might depend upon it that they would get rid to a large extent of the complaints of blackened ceilings, and also the foul and vitiated air from rooms. With regard to the paper, Mr. Carter told them it was composed of "Reflections upon the Commercial Policy of Gas Undertakings." He (the President) would like to know whether the concerns referred to in the paper were all companies, or partly corporations, because, if so, he did not wonder at the difference there was in the figures brought forward; for gas companies, in the first instance, had good managers who had kept the capital down. He could quite understand that in those cases the capital charges would be only 10d. per 1000 cubic feet. He took it that some were corporations who had their undertakings to buy; and if these were managed as some corporations were, he was not surprised that the figures should stand at 19·16d. With regard to borrowing money at 4 per cent., he (the President) thought this was rather hard upon the shareholders; inasmuch as when gas undertakings were first commenced, the original shareholders had to bear the burden and heat of the day, and had to go without dividends for several years. As the companies prospered, so the dividends went up. Then the present shareholders had to purchase their shares at a very high premium; so that they only obtained a return of about 4 or 4½ per cent. Therefore he did not think it was fair for the directors of gas companies to go into the market and borrow money. With regard to service-pipes, they had no right to charge for them, nor for the fixing of meters. The service-pipes were part of the plant. As to the rental for meters, he was not quite certain that it was a fair thing, though the meters were a charge on the capital. However, he did not think any of them would like the grocer to charge so much extra per pound of sugar for the use of the scales. As far as Grantham was concerned, he did not at present see his way to doing without meter-rents; but he wished he did. If he could make as much profit as would leave him with a margin, he would do as much as he could in that direction. The last time, they reduced the price of gas by 5d.; and he then told his Directors that it would be a greater advantage to abolish the meter-rents altogether than to reduce the price of gas 5d. per 1000 feet. The Directors did not at the time agree with him; but since then the Chairman, Vice-Chairman, and the majority of the Board, who were intelligent men, had seen that he (the President) was right. If the matter came up again, the meter-rents would be done away with altogether; and he thought it right and proper to do this. Mr. Carter referred to the poorer class at Lincoln. He (the President) believed that in his Inaugural Address at the spring meeting of the Association, he brought this matter forward. He was quite certain that it was poverty to a great extent which prevented a larger extension of gas consumption. It was the quarterly bill that frightened these people. He was informed that an oil-lamp could now be obtained at 10d. or 15d.; and 2½d. worth of oil could be purchased. It would be much easier for poor people if gas companies could see their way by any means to arrange for shorter accounts; and they would be doing a great work both for the consumers and the shareholders. What they as gas engineers and managers had to do was to evolve the very best they could both for the shareholders and the consumers.

Mr. CARTER said he was personally obliged to the members for the very considerate manner in which the members had referred to the few thoughts he had put on paper to present to them. He did not know that he should satisfy the President very well, when he told him that the gas undertakings referred to in the paper, and which showed serious capital charges, were, without exception, companies. [The PRESIDENT: Abused companies.] He did not know that any lengthy reply was needed to the remarks which had been made. The paper contained what he (Mr. Carter) conceived to be general principles that might not apply in one case more than in another. His chief idea, when he wrote the paper, was this—that for the last 30 or 40 years, they had been, and their predecessors had also been, guided mainly, if not altogether, by their statutory requirements upon all points relating to the manufacture and supply of gas; and it seemed to him that the altered circumstances of the present day rendered it necessary that they should think less about what they were required to do, and more about what they could do to the advantage of their several undertakings. He did not consider that to borrow money upon the cheapest possible terms involved injustice to anybody. As commercial undertakings, they should put themselves in the strongest position; and they should be equipped in the most thorough manner. To compete with other illuminants, they must be placed upon the most favourable circumstances all round. There was one other matter to which Mr. Mitchell referred, and upon which he would just touch, and that was the sliding scale. He (Mr. Carter) thought it would be a matter of policy for the directors of companies to consider whether it would not be to the ultimate advantage of their concerns to reduce the price of gas without taking advantage of the other clauses. It might not always be a wise thing to pay the shareholders increased dividends each time the price was reduced.

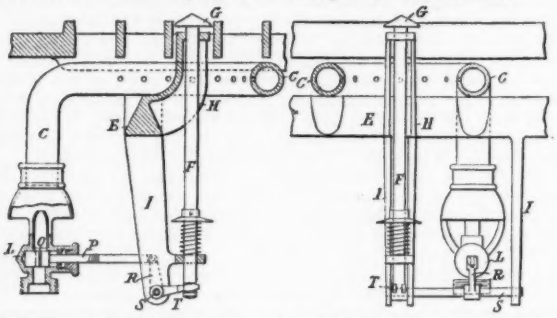
IMPROVEMENT IN THE MIDLAND TUBE TRADE.—A gratifying instance of the improvement which is taking place in the tube trade in the Midlands is afforded by the recent purchase of the Old Britannia Works, Holloway Bank, by Mr. John Spencer (Messrs. J. E. and S. Spencer), of the Globe Tube Works, Wednesbury, for the purposes of carrying out extensions in connection with his business. The Britannia Works have been closed for some time; and the prospect of their restarting will doubtless cause much satisfaction to the inhabitants of the immediate locality.

DEATH OF MR. A. H. WOOD, OF HASTINGS.—We regret to announce the sudden death, on the 15th inst., of Mr. Alfred Hope Wood, for many years Engineer and Manager, and subsequently one of the Directors, of the Hastings and St. Leonards Gas Company. Mr. Wood had for some time been in a weak state of health, for which he had received medical advice; but there was apparently nothing to call for alarm on the part of his friends, as he was able to discharge his usual duties. On the afternoon of the above-named day, however, while walking, with his niece, in the garden of his residence at Hastings, he suddenly fell to the ground, and on assistance being called he was found to be lifeless. The medical man who had been attending Mr. Wood was at once summoned; and he certified the cause of death to have been an affection of the heart. The late Mr. Wood will probably be best known to our readers from his connection with the Southern District Association of Gas Engineers and Managers, of which he was one of the founders, in 1875, the first President, and for many years Treasurer. He was also an Associate Member of the Institution of Civil Engineers, and a member of the Society of Engineers. Had he lived another six months, he would have been connected with the Hastings Gas Company for half a century. He entered their service as a junior clerk, and rapidly worked his way up to the position of General Manager, in which he was succeeded about two years and a half ago by Mr. C. E. Botley, Assoc. M. Inst. C.E. The men employed at the works regarded him with admiration, for he was always desirous of doing what he could for their welfare. In recognition of this, they presented him with his portrait. Apart from his official duties, the late Mr. Wood was known in Hastings as a lecturer; and his connection with the Tabernacle in that town afforded him an opportunity for still higher teaching. He was also the author of a few pamphlets on gas and electric lighting subjects. Mr. Wood (who was a widower) was in his 64th year at the time of his death; and his nearest relations are a brother, a nephew, and a niece—all his children having died in their infancy. The funeral took place last Wednesday, and was numerously attended.

Register of Patents.

GAS-HEATED HOT-PLATES.—Brophy, M. M., of High Holborn, W.C. No. 14,634; Oct. 11, 1888. [6d.]

The object of this invention is to provide means for preventing waste of gas in cooking appliances, by automatically lowering it immediately on the removal of utensils from above the burners, and raising it whenever utensils are placed on the hot-plate over the burners.



The illustrations show a portion of a gas hot-plate arranged according to this invention—taken at right-angles to each other.

The upper frame of the hot-plate supports the bars as usual. C is a Bunsen burner; and E is a bar upon which the burner is supported. F is a vertically sliding-rod, having a conical head G, which projects above the top bars; being carried in the arms or brackets H I, formed integral with the supporting bar E. The conical head is so formed as to allow cooking utensils to be pushed over the burner without damaging the rod. A spring is arranged between the bracket I and a collar on the rod F, serving to normally maintain the rod in its uppermost position. L is a gas-valve arranged in connection with the air-chamber of the burner, the valve proper of which is a piston adapted to bear against a flat seat to shut off the supply of gas from the burner. O is a bye-pass or channel formed in the piston, for allowing a small quantity of gas to pass to the burner so as to prevent the flame being completely extinguished when the valve is closed. The stem P of the valve is connected by a rod to a lever R on a shaft S, which also carries a lever T, the free end of which is located in a slot formed in the lower end of the rod F. With this arrangement it is obvious that, when a cooking utensil is placed or pushed over the burner, the sliding-rod F is pressed downwards, so that the piston of the valve L will be moved to allow a full supply of gas to pass to the burner; and that when such utensil is removed, the spring provided for the purpose will raise the rod and press the piston against its seat, whereby the supply of gas will be cut off.

PRODUCING WATER GAS.—Lloyd, G. H., of Sutton Coldfield, Lloyd, A. L., of Leamington, Bewlay, H., of Moseley, and Sutherland, W. S., of Edgbaston, Birmingham. No. 2246; Feb. 8, 1889. [8d.]

The object of this invention is to overcome one of the difficulties experienced hitherto in the economical manufacture of water gas, which is thus explained by the patentees in their specification: Water gas is produced by passing steam at a high temperature through a column of incandescent coal or coke which has previously been raised to a high temperature by means of an air current in a closed producer. The steam passing through the hot coal cools it; and it has to be heated up again by the air current. During this operation the steam is shut off from the producer, so that in working two distinct alternating operations are going on—first, the heating up of the coal or coke; and, second, the passing of the steam through such coal or coke, thus making water gas. During the first operation ordinary producer gas is made (carbonic oxide with nitrogen); and this gas can either be taken away and used for heating purposes—such as firing boilers, furnaces, and the like—or, what is much more convenient and economical, can be burned in regenerators to which it gives up its heat, and the steam for making the water gas can be passed through these regenerators previously to passing through the heated coal or coke. The economy and advantage of this latter plan of burning the producer gas in regenerators and therewith superheating the steam before it comes in contact with the hot coal or coke, are obvious; and this plan would no doubt in every case of water gas making be adopted, if it were not that there is a difficulty occasioned by the very high temperature caused by burning the producer gas in, or in the immediate neighbourhood of, the regenerators themselves. This difficulty the inventors seek to overcome.

It is proposed to separate the regenerators entirely from the producer by some distance; and to place between them a separate flaming or burning chamber, in which the combustion of the producer gas shall take place previous to the products of combustion being admitted into the regenerator. This flaming chamber is of a form and construction especially adapted to bear the intense heat of the combustion; and is, by preference, of tubular straight form placed horizontally and lined with fire-bricks. When the combustion takes place in this chamber there is no impingement of the intensely-heated gas on any projecting parts, or on arches or corners, as there must be if the gas is burned in the regenerator; and consequently the chamber sustains no damage. The air to support combustion must be admitted so as to cause the combustion to take place in the flaming chamber and not in the regenerators beyond. A convenient way to do this is to admit the air through passages in the brickwork running backwards from the regenerator end of the flaming chamber towards the producer end, where it comes out of the passages and meets the gas from the producer. By this means a double useful effect can be secured—viz., the cold air entering and travelling along the passages helps to keep the brickwork cool; and the air in passing along is partially heated before meeting the gas, and thus assists in effecting combustion.

Fig. 1 is a view (part in elevation and part in vertical section), and fig. 2 a plan of the proposed apparatus. A is a water gas producer, and B a regenerator—of any suitable construction. C is the flaming or

Fig 1.

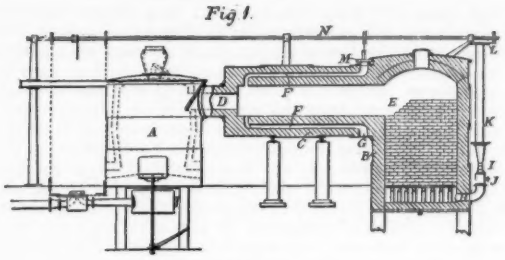
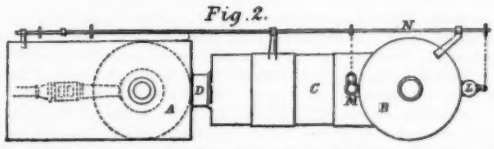


Fig. 2.

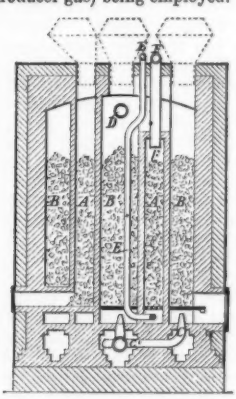


burning chamber interposed between the producer and regenerator. This chamber is preferably in the form of a horizontal cylinder and has fire-resisting walls. D is a passage leading from the chamber to the producer E, opening to the regenerator. F are passages through the brickwork of the chamber C, opening at the end near the regenerator into an annulus G, and at the end near the producer into the chamber C. H is a way from the regenerator leading to a steam-jet I. J is the steam-pipe; and K the exhaust-pipe. L is a valve to the exhaust-pipe; and M one to the annulus G. N is a shaft for giving motion to the valves and also to the other valves usual in apparatus of this class.

The action of the plant is as follows:—When producer gas is being made, the valves L and M are open, and the gas is passed by D into the flaming or burning chamber C, where it meets with air flowing through the passage F, and is burned. The products of combustion then pass down through the generator, and are drawn therefrom, and expelled through the exhaust-pipe L by the action of the steam-jet I. When the fuel in the producer is sufficiently heated, the valves L and M are closed, and steam is caused to flow up the regenerator through the flaming or burning chamber and down through the fuel in the producer.

MANUFACTURE OF WATER GAS.—Cooper, V. B. D., of Victoria Street, Westminster. No. 8519; May 22, 1889. [6d.]

This invention relates to continuous apparatus for the manufacture of water gas; two independent chambers (the one as a retort for the production of water gas, and the other as a furnace for heating the retort and forming producer gas) being employed.



The apparatus consists of three essential parts—the retort A, the outer furnace B, and the inner furnace B^1. These chambers are preferably of circular shape. The retort is of a hollow circular form, and is placed in the centre of the furnace; the space within the retort forming the inner furnace B^1. The tops of the furnaces are connected by apertures formed through the retort A. The furnace B may, if desired, be formed in two or more separate chambers; and it is provided with fire-beds and furnace doors at its lower end, and with sealed hoppers of any convenient construction at the top, for the introduction of the coal, coke, or other fuel under seal. The retort A may be formed in one or more chambers, and is provided with openings at its lower end, communicating with the exterior of the furnace; the openings being fitted with doors, which provide means of withdrawing the coal or coke from the retorts, or for clearing them. The top of the retort is also fitted with hoppers. The air blast is admitted to the furnaces by the pipes C, from the main C^1. The producer gas formed in the furnaces passes away by the outlet D to the place where it is desired to burn it, for such purposes as heating steam-boilers, &c. Steam is continuously admitted into the bottom of the retort A by means of the pipe E, which preferably passes down through the inner furnace B^1 to superheat the steam. The pipe E is fitted with a valve for regulating the admission of the steam; and the water gas, as formed, passes away by the pipe F from the top of the retort to the place where it is desired to burn or store it.

APPLICATIONS FOR LETTERS PATENT.

14,166.—GOUGH, A., "Improvements in steam-engines, gas-engines, and compressed air-engines." Sept. 9.

14,176.—DUKE, J. F., BRIGGS, A. B., and MACPHERSON, R., "Improved means for automatically lighting gas." Sept. 9.

14,231.—MOORS, B. P., "Improvements in gas-meters." Sept. 9.

14,268.—CHESTER, W. R., and SELBY, J., "An improved portable instrument for automatically recording the pressure of gas." Sept. 10.

Correspondence.

[*We are not responsible for the opinions expressed by Correspondents.*]

NEW ZEALAND COAL FOR CHILIAN AND PERUVIAN GAS COMPANIES.

SIR,—Probably the following facts may be of service to Chilian and Peruvian Gas Companies in the matter of their coal supply. On the 2nd of August last a vessel left the port of Dunedin in ballast for Iquique, where she was to load saltpetre for London. I only knew of this a day or two before the vessel sailed; but, after some little trouble and expense, I made arrangements with the captain to send about 20 tons of our best New Zealand coal to be distributed amongst the following Gas Companies—Valparaiso, Santiago, Iquique, San Felipe, and Lima. By some misunderstanding, however, the coal was not shipped, as the captain at the last moment told my agent he would not be troubled with it, as he did not know the charges, &c., that would be payable, or whether carrying even so small a quantity of cargo as 20 tons would not render his ship liable for full port and other dues on the ballast upon his arrival in Chili. Now, as there are occasions when vessels leave New Zealand ports in ballast for Chilian and Peruvian ports, there to load up with saltpetre, copper, and other produce from those countries, would it not be as well in the future for the companies interested to take a cargo of coal, as it could be carried at a cheap rate in lieu of ballast?

The New Zealand coal—*i.e.*, that from the west coast—is an excellent coal for gas-making purposes. There are three classes of this coal—viz., (1) the Brunner, which I use at the Caversham Gas-Works, and which yields per ton from 11,600 to 12,000 cubic feet of gas, of 19 to 20 candle power, 13½ cwt. of good coke, and 13 gallons of tar; (2) the Coalpit Heath coal; and (3) the Coalbrookdale coal. The two latter are almost as good as the Brunner coal. The question is, What can the companies afford to pay for the coal per ton in Chili? Should any of the companies interested wish to learn the results obtainable from the Brunner coal, I believe Mr. F. J. Haseltine, the Chairman, or Mr. E. W. Layton, the Secretary of the City of Dunedin Suburban Gas Company, Limited, No. 2, East India Avenue, would allow the monthly carbonizing returns I send home to them to be examined. The companies could then judge for themselves the results, and the value of the coal to them. Most probably if the shipping companies or shipowners were interviewed in London, arrangements could be made for a round cargo. The captain of the vessel above mentioned informed me that it was about a three weeks' run from New Zealand to Iquique.

I shall be pleased to furnish any information, and, if thought desirable, to do what I can to assist in making arrangements for securing a first-class cargo of coal for shipment when occasion offers.

WM. DALEY, Engineer.

City of Dunedin Suburban Gas Company, Limited,
Caversham, Dunedin, N.Z., Aug. 5, 1889.

Legal Intelligence.

SUPREME COURT OF NEW ZEALAND—WEDNESDAY, JULY 31.

(*Before Mr. Justice* WILLIAMS.)

SCHMIDT *v.* THE DUNEDIN CITY CORPORATION.

CONVICTION FOR ALLOWING THE EMISSION OF SULPHURETTED HYDROGEN FROM THE GAS-WORKS.

To-day judgment was delivered in this case, the facts of which were fully reported in the JOURNAL last week, with a brief notice of the decision, which was in favour of the plaintiff.

HIS HONOUR said: The evidence seems to me conclusive that a nuisance has been caused, and that the plaintiff has suffered damage through the escape of sulphuretted hydrogen generated in the process of the manufacture of sulphate of ammonia by Messrs. Kempthorne, Prosser, and Co. It has been proved also that, though sulphuretted hydrogen gas is necessarily generated in the manufacture of sulphate of ammonia from ammoniacal liquor, yet that if the manufacture is conducted with reasonable care, and in the ordinary way, the gas generated can be got rid of without creating any nuisance at all. The question, therefore, that remains is whether the Corporation of Dunedin, the present defendants, are liable to the plaintiff for the damage so caused. For the purposes of my judgment, I do not think it necessary to discuss the question as to whether the Corporation had power to let, nor whether the agreement entered into with Messrs. Kempthorne, Prosser, and Co. amounted to a lease. I will assume, in favour of the Corporation, that Messrs. Kempthorne were, under the agreement dated Nov. 1, 1888, in exclusive possession of the building in which the sulphate works were carried on, and that this agreement operated as a valid demise of such building to them. By the terms of the agreement it is provided that the Corporation shall dispose of to the Company, and the Company shall accept and take the ammoniacal liquor "in such quantities, at such times, and of such a strength as the same may be produced from time to time at the gas-works during the process of gas manufacture." It is also provided that the Company "shall manipulate the liquor for the purpose of arresting the ammonia therein, or for such other purpose necessary for the utilization of the liquor as they may desire." The Company, for the use of the building and for the liquor supplied, are to pay the yearly rent of £60. The Company are to pump up the liquor from the tank on the Corporation premises through a pipe communicating from the tank to their buildings. They are also to be allowed the use of the Coffey still and the plant in the building, which had been previously used by the Corporation for the manufacture of sulphate of ammonia. The Company agree to indemnify the Corporation from all actions that may be brought against them for any injury to the health or property of any persons caused by the manipulation or manufacture of the ammoniacal liquor by the Company, or by any nuisance that may be caused by such manufacture. No doubt, the general rule is that where land is let or occupied by a tenant, and the tenant commits a nuisance on the land, the tenant and not the landlord is liable. To this rule, however, there are at least two exceptions. First, where land is let with a nuisance existing on it at the time of the demise; and, secondly, when the land is let for a purpose which will naturally create a nuisance, and a nuisance is created. The principle of these exceptions is that, as the landlord is liable if he allows a nuisance to exist on his land, or if he himself creates a nuisance there, he is also liable, if by letting his land with a nuisance upon it, or for a purpose which must inevitably create a nuisance, he authorizes, and by receiving rent derives benefit from, a nuisance being continued or created. Now, in the present case, if the building had been simply let to Messrs. Kempthorne, Prosser, and Co. at a rent, and it had not been part of the arrangement that the Corporation should supply, and Messrs. Kempthorne, Prosser, and Co. should take the ammoniacal liquor produced at the Corporation Gas-Works, it might well be said that the Corporation would not be liable if a nuisance were committed by their tenants. The manufacture of sulphate of ammonia, if properly conducted, will not create a nuisance. To let land, therefore, for the purpose of such a manufacture, will not of itself render the landlord liable if the tenant causes a nuisance by carrying on the business improperly. The distinction between the present case and those cited is the provision in the agreement as to the ammoniacal liquor. This liquor, as is well known, is produced in the manufacture of gas, and has somehow or other to be got rid of. If it is not got rid of, or if great care is not used in getting rid of it, the sulphuretted hydrogen gas evolved from it inevitably creates a nuisance. A duty therefore lies upon the Corporation, as being in possession of the works where this liquor is produced, and of the land on which it is stored, to dispose of it from off their land; and, in disposing of it, to use the utmost care lest a nuisance be created in the vicinity. It was therefore directly for the benefit of the Corporation that Messrs. Kempthorne, Prosser, and Co. should agree to take this liquor off their hands and manipulate it. The nuisance that arose was caused by the joint action of the landlord and the tenant—by the landlord causing to be brought on to the demised premises during the term quantities of material certain to create a nuisance unless properly handled; and by the tenant improperly handling those materials. The handling by the tenant was necessary, as well in the interests of the landlord as of the tenant, since the former was compelled, somehow or other, to get rid of them. Under these circumstances, it seems to me that the landlord is equally responsible with the tenant for the nuisance created. There is a clear distinction between the case where a landlord lets land for a purpose which may or may not create a nuisance, and parts with all right of interference with the land during the tenancy, and the case where the landlord himself continues during the term to exercise a right of interference with the land by bringing dangerous matter upon it. Of course, although the liquor was actually brought on to the demised land by the tenant pumping it, yet inasmuch as the tenant was bound to the landlord to bring it there, the legal result is the same as if the landlord had brought it himself. The matter, however, does not rest there, because it appears that after the attention of the Corporation had been called to the nuisance arising from the escape of sulphuretted hydrogen, which was necessarily generated in the manufacture of sulphate of ammonia, they never seem to have made themselves aware of the process by which Messrs. Kempthorne, Prosser, and Co. professed to get rid of the sulphuretted hydrogen, nor took any steps to remedy the evil. On the contrary, they went on supplying the liquor as before, and so promoted and continued the nuisance, when by cutting off the supply they could have at once abated it. Now that the process used by Messrs. Kempthorne has been described in Court, Mr. Graham, the Gas Engineer to the Corporation, admits its insufficiency. Furthermore, if we look at the duty cast upon the Corporation, as occupiers of the premises where the liquor is produced, so to dispose of it as not to cause a nuisance to the neighbourhood, the case seems one to which the language of Lord Blackburn in *Hughes v. Perceval* (8 App. Cases, 446) properly applies. The Corporation cannot get rid of their responsibility by delegating the performance of this duty to a third person. They are at liberty to employ such third person to fulfil the duty which the law casts on themselves, and, if they so agree together, to take an indemnity to themselves in case mischief comes from that person not fulfilling the duty which the law cast on the defendants; but the defendants still remain subject to that duty, and liable for the consequences if it be not fulfilled. In the present case, I think that the Corporation have, by the agreement, delegated their duty to dispose of the liquor to Messrs. Kempthorne; and that as Messrs. Kempthorne have not properly fulfilled this duty, but have created a nuisance in the vicinity, the defendants are responsible. This is, of course, altogether independent of the relation of landlord and tenant, said to have been created between the parties; and on this ground the Corporation would be liable, even if the building in which the works were carried on had been Messrs. Kempthorne's freehold. As to damages, I think from the evidence, and from personal observation, that the paint on the plaintiff's house has been injuriously affected. The plaintiff has also, I am satisfied, suffered real annoyance from bad smells frequently recurring. I assess the damages at £25. The plaintiff is also entitled to an injunction as prayed, the more especially as the Corporation, by their statement of defence, assert a right to commit the nuisance.

Judgment was accordingly given for the above-named amount, with costs on the lower scale.

THE AUDIT OF THE LIVERPOOL GAS COMPANY'S ACCOUNTS.—The Watch Committee of the Liverpool Corporation have resolved to apply to the Court of Quarter Sessions for the appointment of an Accountant to examine and report upon the accounts of the Liverpool Gas Company; and have recommended Mr. P. B. M'Quie for the purpose.

FAVERSHAM GAS COMPANY.—The first meeting of this Company under the new Act obtained last session was held last Wednesday—Mr. W. E. Rigden in the chair. The business was of a purely formal character. The first thing was to appoint Directors; and the old ones were unanimously re-elected, as were also the Auditors. The Secretary (Mr. Tassell) produced the register of the shareholders, which was sealed with the new seal of the Company, in accordance with the provisions of the Act.

THE EIGHT-HOURS MOVEMENT AMONG GAS STOKERS.—Encouraged by the success of the Kingston gas stokers in obtaining shorter hours and increased pay, the men employed in a similar capacity at the works of the Hampton Court Gas Company lately petitioned the Directors for equally favourable concessions; and their request has been met in a very liberal spirit. Hitherto the stoking of the 80 retorts has been done by two gangs of four men each, working in shifts of twelve hours; giving an average of 20 retorts for each man. Under the new arrangement, the men will work only eight hours, with an average of 17 retorts per man. They are also to receive an increase of wages to the extent of about 3s. per week, and, in the case of the leader of the gang, 5s.; Sunday work to be paid time-and-a-half. Several minor advantages have likewise been granted; the most importnt of which is that the men will be relieved of the coals wheeling. The stokers are very grateful to the Directors for the handsome manner in which their petition has been answered. Last Sunday week, the General Secretary of the Gas Workers' Union (Mr. W. Thorne) addressed a large meeting of men at Leeds. He expatiated on the good results which have followed the agitation among the gas stokers in London; and urged his hearers (who have already established a branch of the Union) to petition the Leeds Gas Committee for an eight-hour shift. Another meeting was held at the Socialist Club; after which it was announced that a good majority of the stokers had already joined the Union.

Miscellaneous News.

THE BOARD OF TRADE REPORT ON THE GAS AND WATER ORDERS OF THE SESSION OF 1889.

The Board of Trade report as to their proceedings under the Gas and Water Works Facilities Act, 1870, during the past session has just been issued. It is stated therein that 14 applications for Provisional Orders were received by the Board in December last year. Power was sought by them to raise £168,000 by shares, and £45,083 by loan, of which £111,000 share and £28,833 loan capital was for gas, and £57,000 share and £16,250 loan capital for water undertakings. The following is a list of the applications:—*Gas:* Buckley; Market Rasen; Melton Mowbray; Otley; Romford; St. Ives (Hunts.); and Warminster. *Water:* Brightlingsea; Corsham; Faversham; Harpenden; Llandrindod Wells; Marlow; and Pocklington.

Five of the applications in regard to the supply of gas—viz., those from Market Rasen, Melton Mowbray, Otley, St. Ives, and Warminster—were from the owners of existing undertakings, who, having no parliamentary authority, sought for such authority to maintain and continue works already constructed and to make and supply gas. Of the other two applications, one (Buckley) was for power to construct gas-works and to make and supply gas; and the other (Romford) was from an existing Company who wished to construct additional works and to raise further capital. Due consideration was given to the various objections lodged against the applications; and the proposals of the promoters were modified in many respects to meet them. It was not found necessary to hold any local inquiry; and in each case an Order was granted. The sliding scale of price and dividend was inserted in all but the Buckley Order; the initial price per 1000 cubic feet being fixed as follows:—Market Rasen, 5s.; Melton Mowbray, 4s.; Otley, 3s. 6d.; Romford, 4s. 6d. and 4s. 9d.; St. Ives, 5s.; and Warminster, 4s. The Otley and Warminster Orders further contain a proviso that the price to be charged for gas supplied to the public lamps shall be 6d. per 1000 cubic feet less than the lowest price charged to any ordinary consumer. As the Buckley Order dealt with works not yet constructed, there was not sufficient evidence available to enable the Board of Trade to decide what would be a fair and reasonable initial price. A maximum price was accordingly allowed; the figure determined upon being 5s. 6d. per 1000 cubic feet. The minimum illuminating power of the gas to be supplied was fixed in all the Orders at 15 candles. The Orders contain the usual clauses as to limits of dividend, the creation of insurance and reserve funds, the testing of the gas, the quantity of land to be taken by agreement, &c. All additional capital authorized is required to be offered for sale by auction or tender; and the Gas-Works Clauses Acts, 1847 and 1871, are incorporated when necessary. The Romford Order contained a clause authorizing the promoters, under certain limitations, to sell gas in bulk beyond the limits of supply.

Of the seven applications for Water Orders, two—viz., the Corsham and Pocklington Orders—were by new Companies, who sought for power to construct water-works and to supply water. The other five were in respect of existing undertakings. Of these, four—viz., Brightlingsea, Faversham, Harpenden, and Marlow—asked for parliamentary authority to maintain and continue works already constructed. The other application (Llandrindod Wells) was in connection with an undertaking authorized by Parliament in 1884; and was for power to raise additional capital only. It was not found necessary, in respect of any of these applications, to hold a local inquiry; and in each case an Order was granted. In all Orders conferring power to charge rates for the supply of water for domestic purposes, the rateable value of the houses, as ascertained by the valuation list, was fixed as the basis on which such rates should be charged; and in no case were the undertakers exempted from giving a constant supply of water as prescribed by the Water-Works Clauses Act, 1847. In the two cases where the construction of works by a new Company was contemplated (Corsham and Pocklington), a clause was inserted providing that if, after the expiration of six years, the undertakers were not furnishing a sufficient quantity of water within the limits of supply, or some part of the district, the Local Authority might exercise their powers under the Public Health Act, 1875, in relation to the supply of water; or any company, body, or person might apply for statutory powers to supply water to the district, or part thereof, as if such district or part had not been included within the limits of supply. With the exception of the Llandrindod Order, the undertakers were in all cases authorized to supply water in bulk by agreement within and beyond the area of supply, subject to certain limitations. In the Harpenden Order, which was promoted by two individuals, a clause was inserted providing that no sale or assignment of the undertaking should have effect until approved by the Board of Trade. The additional capital authorized was in all cases required to be offered for sale by auction or tender. The usual clauses as to regulations for preventing waste, misuse, or contamination of water, as to the supply of water by measure, and as to the quantity of land to be taken by agreement, &c., were inserted, and, where necessary, the Water-Works Clauses Acts, 1847 and 1863, were incorporated.

Three Bills—viz., the Gas Orders Confirmation Bill, the Water Orders Confirmation Bill, and the Gas and Water Orders Confirmation Bill—were introduced into the House of Lords to confirm the Orders made by the Board. The two first-named Bills passed through the various stages unopposed; but the third was petitioned against by the Great Western Railway Company, who were not satisfied with the clause inserted for their protection in the Marlow Water Order. The promoters of the Order contended that the clause was sufficient; and the Board, accepting their view, declined to compel them to adopt the clause suggested by the Railway Company. A Select Committee was appointed; but the petitioners failed to put in an appearance. The Bill accordingly proceeded as an unopposed measure, and duly received the Royal Assent.

The number of Orders made by the Board in relation to the supply of gas and water since the passing of the Act in 1870 is 315, of which 312 have been sanctioned by Parliament. In all, 337 Orders have been applied for, the sum of £24,885 being received as fees.

THE PUBLIC LIGHTING OF BRISTOL.—At a meeting of the Bristol Sanitary Authority last Thursday, Mr. Moss Levy drew attention to the inferior quality of the gas lately supplied to the public lamps in many thoroughfares of the city. He said that in some streets, unless it was a moonlight night, it was difficult to see, on account of the feeble glimmer of the lamps. The Gas Examiner (Mr. Kitt) said the quality of the gas generally in the city had been very good; and he had written to the Gas Company complimenting them thereon. Lamps would go out occasionally. Mr. Levy said in some streets within the last few days there was scarcely any light. The Chairman asked if the Company complied with the terms of their contract as to the illuminating power of the gas. Mr. Kitt replied in the affirmative. Notwithstanding this answer, several members said that Bristol was one of the worst-lighted cities in the kingdom.

SHREWSBURY GAS COMPANY.

The Annual Meeting of this Company was held last Wednesday—Mr A. G. BROOKES in the chair.

The SECRETARY and MANAGER (Mr. W. Belton, Assoc. M. Inst. C.E.) read the notice convening the meeting; and the report of the Directors was then submitted. It stated that there had been a small decrease in the consumption of gas during the year; but there was a further slight improvement in the returns for residuals. The unaccounted-for gas had been 4·95 per cent. The available balance of profit amounted to £5658, out of which the Directors recommended that the authorized dividend be declared. The reserve fund, it was mentioned, stood at £7080, and was fully invested in 2¾ per cent. Consols. A reduction of 2d. per 1000 cubic feet in the price of gas consumed within the borough from June 30 last had been announced. The coal contracts for the current year, it was also stated, had been made at considerably advanced prices; but it was expected that residuals will yield a largely increased return. The gross receipts amounted to £20,852; and the expenditure to £15,626. With the amount brought forward from the previous year, there was a balance available for dividend of £5225.

The CHAIRMAN, in moving the adoption of the report, said the shareholders would notice that the expenditure of capital during the year had been £132—not a very large amount—leaving a balance in hand of £395. But the probability was that in the course of the ensuing year, the Directors would expend nearly, if not all, this sum, though at present they had no intention of issuing fresh capital. There had been a slight decrease in the consumption of gas during the year; but the cause of this was that the days had been lighter. The receipts from the residuals showed a further improvement of £168; and the Directors had entered into a contract for the sale of tar at a much better price than they had had for a long time. The price of coke had slightly increased, in consequence of an advance in the price of coals; and the latter increase would entail an additional cost upon the Company of £600 more than under the previous contracts. Notwithstanding this increase, the Directors had been able to avail themselves of an opportunity to reduce the price of gas from 3s. to 2s. 10d. per 1000 cubic feet; while last year they made a great reduction in favour of the poorer class of people as regards the meter-rents. The two reductions represented a sum of about £1250 per year. But they made them in the hope that they would be a source of very great satisfaction to the consumers generally; and he had no doubt the concession would lead to an increased consumption of gas, as it had done before. The standard of illuminating power was remarkably good; and as regards freedom from sulphur, very few gas companies could touch them. The gas supplied was exceedingly pure; but he might tell those present that their excellent Manager was all the time taking into consideration such things as would promote the interests of the Company, and as far as possible to make good gas at a reduced cost. The outlay for production was likely to be very considerably reduced by apparatus which had been introduced, and which enabled them to consume that which they were in the habit of throwing away, thereby saving a large amount of fuel. Another process, which would be in full operation in a few days, would effect an important improvement in the purification of the gas; for not only would the residual lime be free from the very offensive odour it used to give off, but the gas itself would be purer, and give a much better light than heretofore. Mr. Belton was always using his own knowledge, and availing himself of the knowledge of others, with the object of diminishing the cost and improving the quality of the gas.

Mr. HUMPHREYS seconded the motion, which was unanimously carried.

The CHAIRMAN moved, and Mr. BEACALL seconded—"That a dividend for the year ending June 30 last be now declared, at the rate of 7½ per cent. per annum, upon the Company's stock (deducting the interim dividend of 3¾ per cent. paid in March last), the same to be payable on and after the 30th inst."

The motion was agreed to.

The careful manner in which the Directors and the Secretary and Manager looked after the affairs of the Company was suitably acknowledged; and the proceedings then terminated.

KILMARNOCK CORPORATION GAS SUPPLY.

ANNUAL REPORT.

At the last Meeting of the Kilmarnock Town Council, the annual report and financial statement prepared by the Corporation Gas Committee were formally approved. They showed that the gross revenue amounted to £11,360, and the gross expenditure to £8921—leaving a surplus of £2439. Adding the balance at the credit of the profit and loss account at June 14, 1888 (£9613 0s. 8¾d.), there was a surplus of £12,052. Out of this surplus, the following sums were provided: Sinking fund for payment of mortgage debentures, £3000. Gasholder extension (balance of cost), £645. New coal-shed £290. Accounts for gas and meter-rents irrecoverable, £20 14s. 5d. Added together these amount to £3956, deducting which from the surplus of £12,052, a balance of £8096 is left to be carried to next account. In respect of the manufacture, the report states that the make of gas showed an increase compared with the preceding year to the extent of 2,093,000 cubic feet; while the increase in the amount of gas sold was about 100,000 cubic feet—thus showing a loss in the year 1888-9 of 7,991,850 feet, and equal to fully 12 per cent., being an increase of about 2 per cent. This was accounted for by the heavy loss sustained in emptying the large gas-holder preparatory to its being telescoped; and then having to blow out the atmospheric air when finished. There was an increase of £282 in the year's revenue for the chemical works, which was due to a higher price being obtained for the tar and to the increased production of gas. The year's expenditure for coals was £3589. The gas sold produced £9614; meter-rents, £259; tar, &c., £1142. The mortgage debentures at the close of the past financial year (June 14, 1889) stood at £30,025; and the profit and loss account at £8096. These and other two items brought up the liabilities to a total of £38,796, which was also the amount of the assets, the chief item of which was £33,436 as the value of the gas-works. The amount of coal carbonized during the year was 6736 tons; and the total quantity of gas manufactured was 62,286,500 cubic feet—the produce per ton of coal carbonized being 9360 cubic feet.

REDUCTION IN PRICE.—The Truro Gas Company have reduced the price of gas from 5s. to 4s. 9d. per 1000 cubic feet from the 1st of July. They will allow the usual discount of 25 per cent. if the consumption is 10,000 cubic feet and more per quarter, and 20 per cent. for any less quantity. This will make the net price 3s. 6½d. and 3s. 9½d. per 1000 cubic feet.

THE GAS SUPPLY OF HAYLE (CORNWALL).—The Hayle Gas Company, Limited, has been formed to acquire from Messrs. Harvey and Co., Limited, the new gas-works at Hayle, recently designed by Mr. G. G. Weller. The price is to be £8500, of which £2000 will be in fully-paid shares. Messrs. Harvey, who are large consumers, have entered into a contract with the Company for their supply for the next ten years. It is proposed to sell gas at a cheap rate for cooking and motive power, and there is sure to be a growing demand for gas in the district. The capital of the Company is £10,000, in £5 shares.

THE PADDINGTON VESTRY AND ELECTRIC LIGHTING.

COMPARATIVE COST OF GAS AND ELECTRICITY.

The Vestry of Paddington, being desirous that the electric lighting of the parish should be in the hands of the Local Authority, appointed a Special Sub-Committee to consider the matter. Last Tuesday the Committee submitted a long report on the subject, and it is to be discussed to-day at a special meeting convened for the purpose. The following is the concluding portion of the report:—"As regards the best mode of public lighting by electricity, there seems little doubt that arc lamps are the most efficient and least expensive. Mr. Spagnoletti, Chief Electrician of the Great Western Railway, entertains no doubt on this point. The installation under his charge at Paddington, is one of the most successful experiments in public lighting. This installation supplies energy to 100 arc lamps of 3000 nominal candle power, and 4000 incandescent lights. The real power of the arc equals at least 2000 candles; and the light afforded is greater than would ever be required for street lighting. To obtain the requisite illuminating power, arc lights are placed at a distance of 75 yards from each other. Mr. Spagnoletti calculates that the annual cost of the admirable system arranged by him is not greater than would be that for gas at 2s. 9d. per 1000 cubic feet. The actual cost of public lighting by arc lights is difficult to arrive at; there being an extraordinary difference in the opinions of experts as to the number required for effective street lighting. Professor Forbes calculates that the lights should be 80 yards apart, and that 21 arc lamps would be required for a mile of streets. Mr. Mackie, on the other hand, considers that 10 arc lamps per mile would be adequate. At Eastbourne, 16 arc lights are set up on about a mile of beach; the posts being only 25 feet high, which is considered by the Secretary of the Electric Lighting Company there to be too low. The best position for arc lamps would be at the intersection of streets, in order that the light may be visible for at least 100 yards in each direction—north, south, east, and west. Arranged in this manner, it is probable that 12 arc lamps would not only completely light one mile of main streets, but afford light for about 100 yards in streets crossing the main line. The arrangements at Hastings are identical in all respects with those of Eastbourne. At Taunton, the arc lights run for an average of eight hours, at a cost of £22 10s. per light. It is impossible to calculate the cost of street lighting on a large scale; but the greater the consumption of energy, the smaller would be the relative cost. The Secretary to the Eastbourne Electric Lighting Company states that energy could be supplied for 40 public arc lights at only 20 per cent. greater cost than that of the 16 now used by the town at an expense of £30 per light. Taking everything into consideration, it would appear advisable for the Vestry to entrust the work of electric lighting to a well-established company; and in view of the possibility of the Local Authority desiring to purchase at any future time the undertaking of any company in the parish, your Committee consider that it should be a *sine quâ non* that the central stations for the production and supply of electricity should be constructed, and the distributing mains laid, so as to form a complete installation for Paddington, independent of all connection with other parishes. In conclusion, it may be observed, from the evidence adduced before the House of Lords, that the continuous system, in conjunction with storage batteries, as supplied by the Chelsea Company, is considered preferable for private lighting."

In a series of appendices to the report, the correspondence with a number of electric lighting companies as to the price and conditions of supplying the current is given, as well as an elaborate statement of what are considered to be the advantages of the electric light. With regard to the cost as compared with gas, the House-to-House Electric Light Supply Company submitted a summary of the cost of the light for various-sized installations, based upon the probable consumption for the heavy winter quarter. For ten 16-candle power incandescent lamps in a house where the maximum number required to be used at any one time would be five lamps, with renewal of lamps, rental of meter, &c., they gave £4 0s. 4d., as against £2 15s. 7d. for gas at 2s. 9d. per 1000 cubic feet. For a 29-lamp installation, with 10 lamps in use at any one time, the estimate was £7 11s. 8d.; gas, £5 6s. 3d. For 30 lamps, with 15 in use, £11 3s.; gas, £7 16s. 10d. For 40 lamps, with 20 in use, £14 14s. 4d.; gas, £10 7s. 5d. For 50 lamps, with 25 in use, £18 14s. 8d.; gas, £13 3s. For 100 lamps, with 50 in use, £37 4s. 4d.; gas, £26 1s. The Vestry are urged to undertake the public and private electric lighting of the parish, in order to have the streets and roads under their control, and to be enabled, with any profit which might result from the business, to reduce the rates, and in this way attract new residents into the district. It is pointed out that the parish, being perhaps the wealthiest in London, should be the most paying place for electric lighting; and as, in the case of gas lighting, it is almost invariably found that when the works are in the hands of the local authorities the quality of the gas is excellent and the supply very good, this should be equally the case with regard to electric lighting.

THE BRADFORD CORPORATION ELECTRIC LIGHTING STATION.

Last Friday witnessed the formal inauguration of the electric light works which have been established by the Bradford Corporation. The station is situated in a central part of the borough; and it comprises a boiler-house and engine and dynamo house. The former contains three Lancashire boilers, which, with the fittings, have been supplied by Messrs. Holdsworth and Sons. The three engines are each of 150-horse power; and the plant is equal to supplying 5000 incandescent lamps of 16-candle power. Messrs. Siemens Bros. and Co., Limited, have held the contract for supplying and fixing three sets of steam dynamos and the appliances connected therewith; supplying and fixing electrical instruments, cables, wires, and other appliances—the terms of their tender including superintendence and management of the works for six weeks. It will be remembered that £25,000 was the sum borrowed for this installation. The aggregate amount of the tenders was £18,358, but it was thought likely that there would be certain contingent expenses which would probably bring the cost of the work up to about £20,500; so that, allowing for the sum to be available for maintenance charges for a time, the Gas Supply Committee (who have had the matter in hand) felt that £25,000 was not too great an amount to have available. The work has been carried out under the supervision of Mr. Shoolbred, the Electrical Engineer to the Corporation. The Mayor (Alderman W. Moulson) performed the opening ceremony on Friday. At the entrance to the works, Alderman F. Priestman, the Chairman of the Gas Supply Committee, presented him with a silver-gilt key. His Worship having started the three dynamos, briefly alluded to the action of the Corporation in reference to the works. He said that, as the first municipal body in the kingdom which had ventured to have an installation of electricity, they had had to contend with difficulties such as generally beset persons who engage in new enterprises. They had, however, taken every possible precaution against mishap that experience could suggest; and they had been guided by the best electricians. The works had been placed in the centre of a compact district; and they had been so arranged as to allow of provision being made to meet any need for extending operations. Although six years had elapsed since the Corporation obtained power to construct the works, he did not think they ought to be charged with dilatoriness. On the contrary, he contended that electrical science was at the time in such an imperfect state as to justify delay; and by not enforcing their powers earlier, the Corporation had escaped the disaster which had fallen upon those who were in too great haste to enter upon electrical enterprises. He thought all present would be satisfied with the work which had been accomplished. For the present the works were directed to providing a system of lighting in the interior of buildings; but electricity was capable of being rendered useful in other directions, especially as a motive power; and he hoped to see an extended application of it. If the Corporation had failed to provide a supply of electricity, the matter would probably have been taken in hand by a company, with the result that in a few years there would have been a repetition of the difficulties experienced at the time when the supply of gas and water was under the control of private companies. He called attention to the great contrast between the lighting of the town now and the state of the streets at night when the gas-works were in the hands of a private company; and added that he thought they had in this change a proof of the advantage which accrued to the ratepayers from public works being under their own control. He considered that their experience in regard to the supply of water and gas justified the Corporation's action in reference to electricity. In requiring the cables to be laid in underground trenches, he considered the Corporation acted wisely; for although the method was more costly than the system of overhead wires, it had many advantages. In conclusion, he said the town was greatly indebted to Alderman Priestman for the great service he had rendered as Chairman of the Committee in connection with the electric installation. Subsequently the councillors and a number of gentlemen were entertained to luncheon by the Mayor in the Town Hall. Addressing the assembled guests, Mr. W. H. Preece said he believed the continuous system adopted at Bradford would be absolutely safe. He regarded electricity as not opposed to the interests of gas producers. Gas ought to be used for the production of heat; and if it were applied to working an electrical engine, twice the amount of light could be obtained. Alderman Priestman said the Committee did not expect that the installation would prove profitable for the next two years at least. The lowest possible price to be charged was 5d. per unit; and by fixing it so low, they hoped to induce persons to become users of electricity. Mr. Shoolbred expressed his conviction that at Bradford there was a wide field for the application of electricity in the treatment of sewage.

OUTING OF THE WALTON-ON-THAMES AND WEYBRIDGE GAS COMPANY'S WORKMEN.—On Monday last week the men employed at the works of the Walton and Weybridge Gas Company, accompanied by the Manager (Mr. W. Wood), left Walton by an early train for Bournemouth, where they spent a very pleasant day. A capital dinner was provided at the Quadrant Dining Saloon. This having been partaken of, a portion of the remaining time was spent in a drive to Branksome Chine, and a ramble through the wood to the cliffs; the party returning to the Quadrant to tea. After tea it was unanimously resolved that the best thanks of the men be presented to the Chairman and Directors of the Company for their generosity in providing such a treat for them (the whole expense of the day being defrayed by the Directors); also to the Manager for the interest he had taken on the men's behalf, not only in this, but in every other matter connected with their welfare. A quiet stroll was then taken over the cliffs and through the pine groves; the station being reached in good time for the homeward journey. Walton was reached shortly after ten o'clock.

THE CHESTER TOWN COUNCIL AND ELECTRIC LIGHTING.—A special meeting of the Chester Town Council was held last Wednesday, for the purpose of considering a recommendation of the Watch Committee that application should be made to the Board of Trade for a Provisional Order authorizing the Council to supply electricity for public and private purposes. Alderman W. Johnson moved the adoption of the recommendation of the Committee; expressing the opinion that the Council should have the electric lighting of the city in their own hands. In the discussion which followed, the members of the Council generally urged, in view of the fact that in times past certain private companies had been allowed to secure monopolies of the gas and water supply of the city, that some steps should be taken to prevent this happening in regard to electric lighting. In reply to a question, the Town Clerk explained that if the Corporation did not carry out the powers, they would lapse in two years from the granting of the Order; and no pecuniary obligation rested upon the Council in regard to the matter. He added that the Watch Committee had gone fully into the question of the cost; and to provide an installation to supply the centre of the town would entail an expenditure of about £20,000. The recommendation was adopted unanimously; and the Committee were empowered to take the necessary steps to give effect to the resolution.

DISSATISFACTION OF GAS CONSUMERS AT GUILDFORD.—Judging from the remarks made at a public meeting held at Guildford last Thursday evening, the gas consumers are very discontented with the supply furnished by the Gas Company. The requisition asking the Mayor to convene the meeting to consider the matter, stated that the gas was of inferior quality and deficient in quantity. The Mayor, in opening the proceedings, observed that there was no doubt the gas had been very bad for some time past; and the Directors had not shown any enterprise. He had received a letter from the Chairman of the Company (Mr. M. Smallpiece), in which he said that any complaints made as to the gas supply would be considered and remedied by the Directors. Mr. Schollick then addressed the meeting. He said that he had been grumbling for the past 25 years about the gas furnished to the inhabitants. In his opinion, it was not the quality, but the pressure at which the gas was supplied to them, that was at fault. He thought the Company were wise in sending them an amicable letter, as it disarmed all hostility. He urged upon the Corporation the propriety of acquiring the Company's undertaking. Mr. Cable, a member of the Town Council, considered they had serious grounds for complaint with regard to the pressure; and he believed the gas was impure. Mr. Bentley complained of the illuminating power of the gas. He considered that the Corporation ought to have acquired the gas-works at the time they obtained control of the water supply. The Mayor remarked that the proposal to purchase the property of the Company had often been talked of; but if the gas-works were as profitable as had been stated, they would no doubt have to pay a price in proportion. Other gentlemen spoke in the same strain as those who had preceded them; and ultimately the following resolution was passed with only two dissentients:—"That this meeting beg to inform the Directors of the Gas Company that complaints have been very general as to the quality and quantity of the gas supplied, especially during the day and the early part of the evening; and they beg to press upon the Directors the necessity of improving the same."

METROPOLIS WATER SUPPLY.

The returns furnished to the Registrar-General by the London Water Companies on the water supply of the Metropolis during the past two months show that the average daily supply in July was 186,383,203 gallons, against 169,387,002 gallons in July, 1888; being at the rate of 31·7 gallons per head of the population, as compared with 29·3 gallons in the corresponding month of last year. Of the entire bulk of water sent out, 93,636,938 gallons were drawn from the Thames, and 92,746,265 gallons from the Lea and other sources. Last month the average daily supply was 178,075,702 gallons, against 172,869,385 gallons in August, 1888; being at the rate of 30·3 gallons per head of the population, as compared with 29·9 gallons in the corresponding month of last year. Reporting upon the quality of the supply in July, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was: Kent, 0·4; New River, 0·6; Tottenham, 0·7; Colne Valley, 1·4; Chelsea, 1·4; Southwark, 1·6; Lambeth, 1·6; Grand Junction, 2·0; West Middlesex, 2·2; and East London, 3·0. The water drawn from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was, in respect of organic matter, of unusually good quality, even for this season, when this water is generally at its best; being very largely derived from springs in the chalk and oolite. Of the five Companies drawing from this source, the Chelsea Company delivered the best water. All these waters were efficiently filtered. The water abstracted chiefly from the River Lea by the New River and East London Companies was efficiently filtered. That supplied by the New River Company was of a very high degree of organic purity; surpassing in this respect even some of the deep-well waters. The East London Company's supply, on the other hand, was much inferior to any of the river waters. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health were, as usual, of a high degree of organic purity; the Kent and Tottenham supplies being especially distinguished in this respect. The Colne Valley Company's water was softened before delivery, and was thus rendered suitable for washing. These waters require no filtration. They were clear and bright." With regard to the supply last month, Dr. Frankland reported that the following were the proportional amounts of organic impurity in the waters of the Companies mentioned, taking the above-named standard as unity: Kent, 0·4; New River, 1·1; East London, 1·2; Colne Valley, 1·3; Tottenham and West Middlesex, 1·6; Southwark and Grand Junction, 1·8; Chelsea and Lambeth, 1·9. He added: "The water drawn from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was again, as respects organic matter, of unusually good quality, even for this season, when the river is fed to a large extent by springs in the chalk and oolite. Of the five Companies drawing from this source, the West Middlesex Company delivered the best water. All these waters were efficiently filtered. The water abstracted chiefly from the River Lea by the New River and East London Companies was also of high organic purity; surpassing in this respect two of the deep-well supplies. It was efficiently filtered." The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health were, as usual, very free from organic impurity; and all the waters were clear and bright.

Messrs. Crookes, Odling, and Tidy, in the course of their report to the Official Water Examiner for the Metropolis (General A. de Courcy Scott), on the quality of the daily samples of the water supplied in London last month, say: "The improvement in the London waters, to which we referred in our report for last month [*ante*, p. 421] was well maintained during August. This is seen by comparing the oxygen per gallon required to oxidize the daily samples of the water as supplied by the several Companies:—New River Company: July, 0·024; August, 0·019. East London Water Company: July, 0·045; August, 0·036. Thames-derived Water Companies: July, 0·040; August, 0·037. These details by the oxygen process are fully corroborated by the estimations of the organic carbon and nitrogen. The results generally of our daily examinations show the water as supplied by the several Companies to be entirely satisfactory."

MID-SUSSEX WATER COMPANY.

The works of this Company which Messrs. J. and H. Robus, now of Mansion House Chambers, are erecting at Balcombe, from the designs of Mr. Jabez Church, M. Inst. C.E., the Company's Engineer, are being pushed forward with all possible speed; and it is expected that a supply of water will be available for the residents in the district early next year. The contractors have already completed the 12-inch bore-hole and the service reservoir; and the main to Balcombe village and a large quantity of the supply-pipes are down. When these works are finished and in operation, a real boon will have been conferred on the district, which has hitherto had to depend entirely upon local sources for its water supply. Much inconvenience has frequently been caused by wells failing in dry seasons; compelling those depending upon them to rely on the liberality of those of their neighbours who were better off. Apart from the importance, from a sanitary point of view, of a good and abundant water supply, its advantage in the case of an outbreak of fire is one that does not need emphasizing. In the early days of the Company, some doubt seems to have been entertained as to the advisability of making the Balcombe Hills the basis of their operations, as it was thought that an adequate supply of water might not be found. All doubt as to this has now been set at rest. A spring has lately been tapped, and is yielding an abundance of water, the level of which was not affected by powerful pumping machinery kept constantly at work for several days. The water has been analyzed by Dr. Percy F. Frankland, F.I.C., F.C.S., who has reported it to be palatable and to contain only the smallest trace of organic matter. It is entirely free from any evidence of previous contamination with sewage or other refuse animal substances, and is of excellent quality for drinking and all other dietetic purposes. The water is rather hard; but not more so than ordinary London water. With the works approaching completion, and the prospect of an excellent service of water from them, the residents in the Balcombe district will be relieved of much of the anxiety they have hitherto felt as to the possible failure of the supply; and they should show their appreciation of the Company's enterprise by giving them hearty support.

THE PROPOSED PURCHASE OF THE BOURNEMOUTH GAS AND WATER WORKS BY THE IMPROVEMENT COMMISSIONERS.—A poll of the ratepayers on the question whether the Bournemouth gas and water undertakings should be purchased by the Improvement Commissioners of the town, at a cost of about £407,000, to which reference has been already made in our columns, resulted last Saturday in the rejection of the scheme; 1861 voting against, and 1661 in favour. We understand that nearly 1000 voting-papers were unsigned.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

The Arbroath Gas Corporation on Monday last adopted the resolution which I referred to in my "Notes" in the JOURNAL for Aug. 20, with reference to the application by the Scottish House-to-House Electric Supply Company for permission to supply electric light in the burgh. The Corporation are now committed to the policy, not only of opposing the application of the Company, but of promoting an electric lighting scheme of their own. I believe they will not be singular in that respect; Aberdeen, for one place, being about to act on the same lines. The feeling seems to exist that, though a Provisional Order were obtained by a body supplying gas, the condition which requires a fourth of the inhabitants of the proposed area to give a three-years' guarantee for the use of electricity, would make it difficult to start an installation, and that thus the gas supply might not be disturbed.

The lighting of the streets of Dundee cost in the past year £5890, which was £110 under the estimate. For the current year the estimate is £6014—practically the same as last year. While that is so, the lighting will be better, as the Police Commissioners have to a large extent replaced single-jet by flat-flame burners, and are able to furnish more light, because the Gas Commissioners in the past year reduced the price of gas for public lighting by 2½d. per 1000 cubic feet. During the current year there is to be an extended use of the improved burners.

An appeal was heard at Kirkwall on Friday of last week, at the instance of the Kirkwall Gas Company, against the valuation of their works, which the Assessor had fixed at £140. The Company wished the valuation reduced to £100. On their behalf, Mr. W. Hourston, the Manager, contended that the valuation, if based upon revenue, was excessive; and if upon outlay, then the outlay which the Assessor had taken into account, was for repairs and not extensions. The Assessor admitted that, upon the authority of Lord Lee, the valuation of gas-works was a very difficult matter. There were five decided cases, however, which proceeded upon the basis of revenue. In this instance the statement of income and expenditure showed a deficit for the year of £140; but on scrutinising the statement, he ascertained that the deficit was occasioned by the large amount deducted for repairs. In these circumstances, as he could not enter a deficit on the valuation roll, he had taken an average of the expenditure upon repair of the works for five years, and had deducted that, as well as the maximum allowance for tenants' profits, from the revenue. That brought out £178; but, desiring to give no cause for complaint to the Gas Company, he had put it down at £140. Even although the works were at a standstill, he considered they would be liable to valuation according to the capital expended; and he maintained that he had acted correctly. The Bench dismissed the appeal, and granted a case for the Supreme Court.

At a meeting last week of the Kirkcaldy and Dysart Water Commission, the Clerk reported that Messrs. J. Ross and Sons, the Contractors for the new water-works, had withdrawn their appeal to the House of Lords, and agreed to pay the costs of the Commissioners as taxed. The appeal arose out of the Court of Session sustaining the decision of Mr. Leslie, C.E., as Arbiter; Messrs. Ross and Son objecting to Mr. Leslie on the ground that he was one of the Consulting Engineers of the Water Commissioners. With reference to the dispute between Messrs. Ross and Mr. Sang, C.E., as to the amount still due to the firm (amounting to over £1300), a Committee was appointed to meet the contractors and Mr. Sang, with a view of arriving at an amicable settlement. Mr. Sang stated that the completion of the works was thirteen months beyond the time contracted for, which, at the rate of £100 per month, rendered the Contractors liable to the Commissioners for £1300.

On Tuesday the Kirkcaldy and Dysart Water Commissioners visited their new water-works at Lothrie and Harperless. It is now over twenty years since the Lothrie water was introduced to Kirkcaldy; but owing to the large increase in the population, and the number of public works erected since that period, the water became scarce; and in consequence, the Commissioners, about three years ago, agreed to erect a large storeage reservoir about a mile distant from the existing works. The new works have now been completed at a cost of above £30,000. The reservoir is calculated to hold 80 million gallons of water—the embankment being no less than 600 yards in length. It lies to the west of the present works, and is about 13 miles from Kirkcaldy. There is also a compensation reservoir at Ballo, capable of storing 195 million gallons; another at Drumain, which is called the town reservoir, capable of holding 21 million gallons; and at Carberry, the intermediate reservoir, with a capacity of 1½ million gallons, or a day-and-a-half's supply. The daily consumption is about 1,050,000 gallons; and with the present large additional storeage provided by the Commissioners, Kirkcaldy and the neighbouring district will have an abundant supply of pure water for years to come.

For some time there has been a scarcity of water in Dunfermline, which has, to some extent, been attributed to the consumption in connection with the erection of the Forth Bridge. It was anticipated that, with the completion of the bridge, the supply would be sufficient for the burgh. But the Town Council are now advised that the railway is likely to consume as much water as is required at present; and the Council resolved to lay down a new main from their reservoir at Craigluscar to the centre of the town, at a cost of between £3000 and £4000.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

The extension of the Saltcoats Gas-Works, now belonging to the Burgh Commissioners, has been practically completed; and yesterday the ceremony of letting the gas into the new holder was performed in presence of the municipal authorities. An abundant supply of good gas may now be confidently expected. The new holder, which has been in course of erection during the past ten weeks or so, has a capacity of 57,000 cubic feet—being an increase of 49,000 feet on the storeage capacity of the works. The holder is a telescopic one, of two lifts, and of a total height of 30 feet; while the tank, which is formed of cast-iron plates, is 51 feet in diameter and 16 feet deep. There are six columns, which are held in position by means of two sets of lattice girders. Another considerable improvement is the erection of a tower scrubber, 20 feet high and 3 feet in diameter, which has been so arranged by the Manager (Mr. Galbraith) as to work in conjunction with the old washer. The contract for the whole of the apparatus was executed by the Barrowfield Iron-Works Company, Limited, of Glasgow.

For several years past the business of the Lanark Gas Company has been conducted under a very serious disadvantage, arising from a want of holder capacity at the works. Having bought up the works and plant of the Gas Consumers' Company, they used the holder there; and this being at the opposite end of the town, they required to have a full pressure on the whole town all day so as to force the gas into that holder, with the result that there was always a large amount of leakage—even as much as

14 per cent. This unsatisfactory state of things went on for a long time. But early in the present year a movement was madeto do away with the grievance by the erection of a new holder at the works; and last Tuesday, at the request of his brother Directors, ex-Provost Brown, Chairman of the Gas Company, turned the gas on to the new holder, the construction of which was carried out by the Barrowfield Iron-Works Company, of Glasgow. The holder is on the telescopic principle, and has capacity for 56,000 cubic feet of gas.

The dissatisfaction which has been felt and frequently expressed in the village and district of Cambuslang (near Glasgow) regarding the quality of the gas supplied by the Gas Company, and the high price charged for the commodity, came to a head last Tuesday evening, when a public meeting of the gas consumers was held. At their request the meeting was called by Mr. Gilmour, Chairman of the Local Authority, to consider what steps should be taken to remedy the grievances complained of. There was a very large attendance; the place of meeting being crowded to its utmost capacity. In the course of his opening speech, the Chairman expressed the hope that the outcome of the meeting would be that the people of Cambuslang and district would get brighter gas, and at a much cheaper rate than they were being charged. The proceedings were occasionally somewhat lively; but throughout they showed on the part of many speakers a determination to carry the matter to the bitter end. The first resolution was to the effect that, in the opinion of the meeting, the gas supply of the village and district was, and had long been wretchedly inferior in quality, considering the price charged, and that, in the interest of the consumers, the matter demanded an immediate remedy. This resolution was supported by a number of speakers, several of whom seemed to think a request to the Glasgow Corporation should be made to have their gas supply extended from Rutherglen to Cambuslang. A certain amount of doubt prevailed, however, as to the probability of the Glasgow Gas Corporation consenting to do anything of the kind. Another resolution was to the effect that a Committee should be appointed to wait upon the Cambuslang Gas Company and lay the gas consumers' grievances before them, and endeavour to secure the desired remedy—namely, an improvement in the quality, and a reduction in the price. That was also carried; and the Committee duly appointed. As regards applying to the Glasgow Gas Commissioners, I think I may say with confidence that the Cambuslang agitators will depend upon a broken reed if they expect Glasgow gas to be sent to a district which is already occupied by an existing Gas Company. Towards the end of the proceedings, it was suggested by one of the speakers that, if the Committee failed both with the local Gas Company and with Glasgow, they should apply to the North British Water-Gas Company—a remark which was received with great laughter. I would here repeat a suggestion to the Cambuslang people which I have formerly made—to get the place constituted a burgh; and then they can proceed under the Burghs Gas Supply (Scotland) Act.

At a special meeting of the Dumbarton Town Council, held on Wednesday night, the assessments for the current year were agreed upon after a long statement had been made by Provost Babtie, who presided. As to the gas accounts for the past year, he stated that they were still unaudited; but from the trial balance which had been made and verified, it appeared to be one of the most prosperous years that the Gas Commissioners had yet had. As they had made a very advantageous contract for the disposal of the residual products, and the coals had been purchased on excellent terms, there was no reason why the present year should not be similarly prosperous. Under these circumstances, the Gas Committee had pleasure in recommending that the price of gas should be reduced from 3s. 6d. per 1000 cubic feet to 3s. 3d. to ordinary consumers, and from 3s. to 2s. 9d. for public lamps. The recommendation was agreed to.

This has been an active week in Scotch pig-iron warrants; the market showing considerable strength from the opening on Monday. Yesterday 47s. 8d. was reached, and business was done thereat—this being the highest price recorded since 1887; and to get a higher price we have to go back to 1883, when the figure touched was 49s. Most of the special brands have gone up in price by leaps and bounds; Carron No. 1 making a rise of 5s. per ton at one bound. There have been large deliveries from the public warrant stores amounting to 3355 tons for the week.

A fairly active business has been done in the local coal trade during the week, and prices remain firm. In nearly all cases miners have received an advance of wages.

Carlisle Corporation Gas Supply.—In noticing the working of the Carlisle Corporation gas undertaking last week, we omitted to mention that the coal carbonized (17,284 tons), besides yielding 193,151,000 cubic feet of gas, produced 8895 tons of coke, of which 2760 tons were used in manufacture, and 240,725 gallons of tar. With the ammoniacal liquor, 166 tons 18 cwt. of sulphate were made. Of the total bulk of gas made, 160,201,200 cubic feet were sold to private consumers, 23,235,200 cubic feet were used for the public lighting, and 2,225,000 were burnt on the works and in the offices; leaving 7,489,600 cubic feet, or not quite 4 per cent., unaccounted for.

Fatal Accident at the Derby Gas-Works.—On Monday last week, at the Derby Town Hall, the Borough Coroner and a jury held an inquest on William Taylor, aged 38, a labourer, who had been employed at the Derby Gas-Works. It appeared that some time ago deceased was at the works in Cavendish Street, and went up a ladder to clean a scrubber. On taking off the lid he called out that he was "gassed," and fell backwards a distance of about 18 feet. He was taken to the Infirmary, where he remained for several weeks and ultimately died. Medical evidence showed that death was caused by an injury to the spine, the result of the accident; and the jury returned a verdict accordingly.

Reported Lead-Poisoning at Keighley.—At the meeting of the Keighley Board of Guardians last Wednesday, it was stated that the Medical Officer of Health had reported that 84 per cent. of the inmates of the Keighley Workhouse and Infirmary were suffering from lead-poisoning. The water is supplied by the Keighley Corporation, and comes direct from the works, without undergoing filtration. It is stated that a large percentage of the inmates suffering are unable to throw off the disease, owing to their weak condition. At the same time it is strange the water has not affected the master and matron or their children. The Corporation are to be asked to take immediate steps to provide a remedy.

The Cost of Gas at the Hanwell Schools.—At the meeting of the St. Saviour's Board of Guardians last Thursday, Mr. Sharman inquired whether it was correct, as reported, that the Managers at the Hanwell Schools were making gas at a cost of 5s. 4d. per 1000 cubic feet, whereas the local Gas Company supplied it at 3s. 2d. The Chairman (Mr. C. Hart) replied that the matter had been under discussion that day, and he thought some change would be made. He said it must be remembered that the cost of the gas itself was 2s. 10d. per 1000 cubic feet, and that the balance was required for the repayment of the loans for the plant. Of course, the Managers would have to pay this, whether they had their gas from the Company or not.

CURRENT SALES OF GAS PRODUCTS.

Liverpool, *Sept.* 21.

Sulphate of Ammonia.—The market has remained steady, although the demand has not been quite so good, and in some instances quotations have been lower. For some small immediate parcels, previous rates were still realized; but the principal inquiry is now for spring delivery, and the opinion is gaining ground that, during October and November at all events prices may be considerably easier. Of course, any important decline during the next two months would furnish consumers with a reason for making their purchases earlier; and thus a more serious fall would be prevented. But their confidence in the future of sulphate is considerably shaken by the unfavourable position and extreme dulness of the nitrate market. The steady maintenance of the large difference in the values of nitrate and sulphate, during the whole of the summer (as previously pointed out) will prevent sulphate manufacturers from giving way very readily; and much will depend upon the quantities which will have to come on the market in the immediate future. There is apparently not much English sulphate sold beyond the present month. To-day's quotations are £12 2s. 6d., f.o.b. Hull and Liverpool; and £12, f.o.b. Leith. October-December quotations are slightly below this.

London, *Sept.* 21.

Tar Products.—The inquiry for tar products, and the business done during the past week, has been very considerable; but no remarkable change has taken place in the prices. Anthracene is distinctly firmer, as considerable quantities have of late been removed from the market. Pitch is also in excellent demand at the following prices 22s. to 23s. 6d. per ton. Carbolic and other produce remain about the same. Prices may be taken as follows:—Tar, 21s. to 27s. 6d. per ton, according to position. Benzol, 90 per cent., 3s. 1d. per gallon; 50 per cent., 2s. 2d. per gallon. Toluol, 1s. 5d. per gallon. Solvent naphtha, 1s. 4d. per gallon. Crude naphtha (30 per cent.), 1s. per gallon. Light oil, 3½d. per gallon Creosote, 2¼d. per gallon. Carbolic acid (60's), 3s. 7½d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. to 20s. per ton. Anthracene (30 per cent.), "A" quality, 1s. 2d. per unit; "B" quality, 11d. per unit.

Ammonia Products.—Sulphate of ammonia has improved somewhat, and to-day prices may be taken at £12 to £12 5s.

The Disposal of Gas Profits at Stoke.—At the meeting of the Stoke Town Council last Thursday, Alderman Leason, in moving the adoption of the report of the Finance and Rate Committee, said it would be within the recollection of the Council that during the year the Gas Committee had applied a sum of £2500 profits in the reduction of the district rate. He had now pleasure in stating that the Committee had handed over to the Borough Accountant a further sum of £1000 as accumulated profits from the gas-works. He had hoped that with this sum they would be able to pay off the mortgage on the Free Library; but he found they had no power to utilize the profits in that way. He would like to suggest as a recommendation to the Council that the debt of £984 on the revenue account, which had been carried forward from the old market account, should be wiped off with the sum presented as gas profits. The report was adopted.

The Salford Town Council and Electric Lighting.—The Salford County Borough Council had a special meeting last Friday, to consider the notice given some time ago by the Manchester House-to-House Electricity Company, Limited, of their intention to apply for a Provisional Order to enable them to supply electricity in the borough. The Town Clerk (Mr. S. Brown) stated that if the Council thought proper to make application for power to light the borough at any future time by electricity, then the Board of Trade would not in the face of this grant such power to an outside company. The Mayor (Alderman Dickins) proposed a resolution that the Corporation should apply to the Board of Trade for a Provisional Order authorizing the Corporation, as the local authority, to supply electricity for public and private purposes within the area of the county borough. The Ex-Mayor (Sir J. Farmer) seconded this motion. One or two members seemed to think that the proposed application was to be made merely for the purpose of delaying the introduction of electricity in the borough. The Mayor said that if the Order was granted, it would enable the Corporation to supply electricity if it was thought desirable; and he considered that they should be placed in a position to protect themselves against rival companies. The resolution was adopted.

The Maidstone Rural Sanitary Authority and the Water Supply of the District.—In consequence of the hostile attitude assumed by the Maidstone Rural Sanitary Authority, the parishes of Marden, Staplehurst, and Yalding were taken out of the Bill promoted by the South Kent Water Company last session, to enable them to supply water in the district of the Authority. By this time no doubt that body repents its opposition. Since the passing of the Bill, the Medical Officer of Health for the above-named parishes has reported most strongly on the necessity for the supply of good water; and in consequence of this forming a portion of the annual sanitary statement, the Local Government Board, with more sharpness than is always displayed in Government departments, have detected a matter for inquiry. At the meeting of the Authority last Thursday, a letter was read from the Board, stating that as opposition was offered to the scheme of the Water Company, it was to be presumed that the Authority had some plan of their own which they purpose carrying out, in order that the urgently-needed supply of water in the parishes referred to should be furnished; and they requested to be informed as to what action it is intended to take in the matter. The reading of the letter did not give rise to any discussion; but now that the Central Board has asked the question, something more than a bare acknowledgment of the communication will have to be made.

Proposed Electric Lighting Company for Fareham.—A public meeting was held at Fareham yesterday week, to consider the question of forming a company to supply electricity in the district. In opening the proceedings, the Chairman (Captain Ramsay) stated that he considered the price charged for gas in the town (4s. 2d. per 1000 cubic feet) was too dear; and he thought that by co-operation they might float an electric lighting company. Mr. J. Blake addressed the meeting at some length. He said that they could start a company with a capital of £5000, in £1 shares. The works and plant would cost about £4000; and this would include all the working plant. The annual expenses would be about £600 or £700; whilst he estimated the receipts to be about £1000. He stated that the cost of public lighting last year was £460; there being about 120 lamps. Altogether from these lamps they had an illuminating power of slightly above 2000 candles. The estimate, however, for this year was £500; and for this amount there could be erected 30 arc lights, giving an illuminating power of 36,000 candles. After the matter had been fully debated, papers were passed round the room for those present to fill in, stating the number of shares they were willing to take. Mr. Blake remarked that already £1000 had been subscribed by personal friends. Several of the papers were then handed to the Chairman; and Mr. Blake intimated that in a few days a prospectus would be issued.

EXPLOSION AT THE ALDERSHOT GAS-WORKS.—At about four o'clock on Monday morning last week, a leakage of gas in the meter-house at the Aldershot Gas-Works was the cause of an explosion which blew down the walls and did other damage, which, however, was confined mainly to the building in which the accident occurred. Although the noise of the explosion caused some alarm in the town, it was soon allayed; and the regular supply of gas was not in the least affected.

GAS EXHIBITION AT HASTINGS.—To-day an exhibition of gas lighting, cooking, and heating appliances will be opened in the Public Hall, Hastings, by the Hastings and St. Leonards Gas Company; the opening ceremony being performed by J. Brown, Esq., J.P., the Chairman. Lectures on cooking by gas will be given by Miss Cameron; and one on "The Uses of Gas and the Sanitary Aspects of Gas Lighting," by Mr. Chas. E. Botley, Assoc. M. Inst. C.E., the Company's Engineer. The exhibition will remain open till Friday.

THE DUBLIN CORPORATION AND ELECTRIC LIGHTING.—In the course of the discussion on electric lighting at the recent meeting of the Dublin City Council (a report of which appeared in our columns a fortnight ago), Mr. Gill stated that the shares in the House-to-House Electric Light Supply Company were selling at a heavy discount at the present time. Mr. Robert Hammond, the Managing-Director of that Company, writes that Mr. Gill was evidently under a misapprehension when he made that assertion, and that the Company is in a very sound position. Referring to another point in Mr. Gill's speech, Mr. Hammond points out that he omitted all mention of the Brighton Company, "which has for the last three years regularly paid dividends to its shareholders, after setting aside annually fair sums for depreciation."

THE DUBLIN CORPORATION AND THE GAS COMPANY.—The arbitration proceedings in connection with the matters in dispute between the Dublin Corporation and the Alliance and Dublin Consumers' Gas Company will commence on Monday next before Messrs. A. G. Vernon Harcourt and H. E. Jones as Arbitrators, with Mr. J. Shiress Will, Q.C., as Umpire. The main object of the arbitration, apart from some questions of account that have arisen between the opposing parties, will be to settle the conditions of the future supply of gas for the public lighting of the city, having regard to the Acts of Parliament and other matters relating to the subject. Amongst the questions of detail to be settled, it is understood that the following are included: Whether the site of the gas testing-station as at present existing is a proper one; whether proper facilities are now afforded for testing the gas by the Corporation and the Company; and whether the gas-mains are properly connected with the testing-station. It would seem that the ground to be covered by the arbitration is sufficiently wide to settle all substantial matters in controversy.

LEEDS CORPORATION GAS AND WATER SUPPLY.—The abstract of the accounts of the borough of Leeds for the year ending the 25th of March last has lately been issued by the Borough Accountant (Mr. Derry). We find therefrom that the sum expended on gas manufacture was £174,666; on repairs and renewals, £35,986; general expenses, £19,247; and interest, £49,879. On the other side of the account we find rents amounted to £242,702, less estimated discount £8000, and leakage £2200. The receipts from gas-stoves and other property amounted to £1020, and from residual products to £60,805. For redemption of debt there was set apart £9407; and the surplus profit amounted to £6421. The water revenue account shows that salaries amounted to £1518; miscellaneous items to £2166; Washburn works, £552; filter-beds, £503; Arthington pumping-station, £1325; Headingley pumping-station, £1124. The surplus on the revenue account amounted to £6931. The expenditure on capital account shows £1977 on general works; £223 on the high-level extension; £3603 on the Blackmoor tunnel; £6873 on the Weetwood conduit; £2150 on the Weetwood gauge basin; and £11,196 on the Arthington main.

YEADON WATER SUPPLY.—The defective water supply of Yeadon, as our readers are aware, has been a fruitful cause of complaint and discussion for a long time; but at last there seems to be a prospect of the long-continued controversy being brought to an end. It will be remembered that the Yeadon Local Board some time ago took action against the Yeadon Water Company, declaring that the Company had failed in their duty of furnishing a sufficient quantity of water suitable for drinking and ordinary domestic purposes. Arbitration took place on this issue; and, after some abortive proceedings, the Umpire (Mr. S. Jackson, of Bradford) gave his award in favour of the Local Board. On appeal, this decision was upheld; but subsequently it was reversed on a technical point—the Water Company in the meantime having pushed forward a scheme for providing a much more efficient supply. They obtained an Act last session enabling them to carry out this scheme; and now steps are being taken to proceed with the works. It is proposed to construct a storeage reservoir of a capacity of 93 million gallons, with the usual conduits and a series of sand filter-beds, in three divisions. The capacity of the reservoir will allow of the delivery of 30 gallons per day per head of the present population, which is estimated at about 10,000. The Company have hitherto furnished water to a portion of Rawdon; but the new Act empowers them to supply the whole of that township and other districts in the vicinity. The new supply will probably be available in about a year-and-a-half from the present time. Mr. A. E. Preston, M. Inst. C.E. (Messrs. M'Landsborough and Preston, of Bradford), is the Engineer for the works.

FATAL EFFECTS OF A GAS EXPLOSION.—Mr. Wynne E. Baxter, Coroner for the South-Eastern Division of the County of London, held an inquiry last Thursday, at the Bromley Vestry Hall, into the circumstances attending the death of Eliza Flower, aged 66, the widow of a ship builder, lately residing at 20, Campbell Road, Bow Road, who died of injuries resulting from a gas explosion, which occurred at her residence on the 15th ult. Edward Flower, a barge builder, said, on the above-named day his mother was in a downstairs room in the house, and he sat reading in the drawing-room. At 10.10 p.m. he went into the dining-room to see that all was right previous to retiring to bed. He returned to the drawing-room to await his mother, when suddenly there was a loud explosion, followed by flames. He saw his mother lying at the bottom of the stairs in the embers of her dress. He succeeded in putting out the flames, and getting her to the door leading to the street, where someone took her from him. A medical man was fetched who dressed the wounds; and the next day Dr. Sliman, the family doctor, was summoned, and attended the deceased till her death. After some further evidence, Fireman Jeanes said he examined the premises, and found that the gasalier in the room in the basement had not sufficient water in it, so that when pulled down the small pipe was above the water, and the gas could escape. Outside the door was a gas-bracket, which was alight at the time of the accident; and he was of opinion that, the room having been closed, the gas had accumulated, and when the door was opened it exploded on coming in contact with the light in the passage. The medical evidence was to the effect that the immediate cause of death was blood poisoning. The jury returned a verdict that the deceased died from pyæmia, the result of an explosion of gas; but how such explosion originated the evidence failed to make clear.

THE SALFORD GAS-STOVE EXHIBITION.—A building is in course of erection on the lawn in Peel Park, Salford, in which the exhibition of gas fires, cooking-stoves, engines, and burners, which is being promoted by the Gas Committee of the Corporation of that town, will be held. Arrangements will be made for the cooking of dinners, &c., at the exhibition, which it is expected will be opened early next month. The building is to have a double canvas roof.

NORTHERN COAL TRADE.—There has been a good demand for steam coals for the past few days; but there are signs that the exports to the Baltic are falling off, and that there will soon be a diminution in the inquiry for this class of coals. For gas coals the demand is now enlarging rapidly, and will soon be at the height for the season. Still, the shipments are being satisfactorily made, and the London Gas Companies must be freely laying in stock this month. The price of best gas coals is now 9s. per ton; and for one of the Durham kinds as high as 10s. has been asked, though no such price has been paid as yet. The tenders have been sent in for the supply of the largest of our local companies; and it is believed that the price generally asked for the coals will be a little over 9s. for the whole of next year. The Gas Companies find a very large demand for gas coke; and this and its better price will, with the higher returns for other residuals, compensate in a large degree for the undoubted advance they will all have to meet in the cost of their coals. Should the Durham miners claim a further rise, as is expected they will do, the price may go still higher.

THE PLYMOUTH CORPORATION AND THE WATER SUPPLY OF THE OUTLYING DISTRICTS.—The terms under which the Plymouth Corporation will undertake to supply Tamerton Foliott—an outlying village which has already given rise to dispute between the Corporation and the Devonport Water Company—with water, came before the Plympton Rural Sanitary Authority last Friday for consideration. The Corporation offer to lay the mains, on condition that the Authority fill in the excavations and repair the roads, at an estimated cost of £160; the water to be supplied by meter at a charge of 6d. per 1000 gallons, subject to the payment by the Authority of an annual minimum sum equivalent to 10 per cent. on the outlay, estimated at £350, on the works executed by the Corporation. A resolution passed by the ratepayers of the village was read. It declared that the terms of the Plymouth Corporation were too high, and expressed the opinion that if the wells were protected from pollution by sewage, the village would have an ample supply of pure water. The sanitary inspector was instructed to prepare plans for the drainage of Tamerton, in order to protect the wells from contamination.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 593.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Apr.	10½	Alliance & Dublin 10 p. c.	10	19—20	..	5 5 0
100,000	10	"	7½	Do. 7 p. c.	10	13—14	..	5 7 2
800,000	100	1 July	5	Australian (Sydney) 5% Deb.	100	109—111	..	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	26—28	..	7 2 10
200,000	5	15 May	7½	Bombay, Limited	5	7¾—7⅞	..	4 16 8
40,000	5	"	7½	Do. New	4	5—5½	..	5 9 4
880,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	228—233	..	5 5 2
125,000	"	"	9½	Do. New	100	162—167	..	5 10 6
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	42—44*	..	5 0 0
320,000	20	28 Mar.	11½	British	20	46—48	..	4 13 9
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21*	..	5 4 9
89,000	10	"	8	Do. 7 p. c.	10	13—14*	..	5 14 3
328,750	10	30 May	10	Buenos Ayres (New) Limited	10	14—15	..	6 13 4
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	106—109	..	5 10 6
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	11 Apr.	13½	Commercial, Old Stock	100	269—274	..	5 0 8
130,000	"	"	10½	Do. New do.	100	x13—218	..	4 18 0
130,000	"	28 June	4½	Do. 4½ p. c. Deb. do.	100	122—125	..	3 12 4
557,320	20	14 June	13	Continental Union, Limited	20	47—49	..	5 6 2
242,680	20	"	13	Do. New '69 & '72	14	53—54	..	5 6 7
200,000	20	"	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	204—208	..	4 16 2
234,060	10	26 July	13	European, Limited	10	24½—25½	..	5 1 1
120,000	10	"	13	Do. New.	5	7½ 17½—18½	..	5 5 3
354,060	10	"	13	Do. do.	5	12—12½	..	5 3 9
5,470,040	Stck.	14 Aug.	13½	Gaslight & Coke, A, Ordinary	100	261—265	..	5 3 9
100,000	"	"	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	100	255—260	..	3 16 11
80,000	"	"	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	"	"	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,800,000	"	"	7	Do. H, 7 p. c. max.	100	166—171	..	4 1 10
468,000	"	"	10	Do. J, 10 p. c. Prf.	100	253—258	..	3 17 6
1,051,150	"	14 June	4	Do. 4 p. c. Deb. Stk.	100	121—124	..	3 4 6
294,850	"	"	4½	Do. 4½ p. c. do.	100	127—131	..	3 8 8
650,000	"	"	6	Do. 6 p. c. do.	100	171—175	..	3 8 6
3,600,000	Stck.	15 May	10	Imperial Continental	100	211—215	..	4 13 0
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p.c. Deb.	100	115—117	..	4 5 6
541,920	20	14 June	6	Monte Video, Limited	20	21—22	..	5 9 1
150,000	5	30 May	10	Oriental, Limited	5	9—9½	..	5 5 8
60,000	5	28 Mar.	7	Ottoman, Limited	5	6½—6⅝	..	5 3 5
166,870	10	26 July	4	Pará, Limited	10	4½—5½	..	7 5 3
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	103—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
100,000	10	26 Apr	10	San Paulo, Limited	10	16—18	..	5 11 1
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	312—317	..	5 2 6
1,850,000	"	"	12½	Do. B do.	100	237—243	..	5 0 2
141,500	"	"	13½	Do. C do.	100	250—260	..	5 1 11
600,000	"	28 June	5	Do. 5 p. c. Deb. Stk.	100	159—163	..	3 9 11
60,000	5	12 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—15*	..	4 8 5
						*Ex div.		
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	273—278	..	3 8 4
1 720,560	Stck.	11 Apr.	7½	East London, Ordinary	100	215—220	+1	3 8 2
544,440	"	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	143—146	..	3 1 7
700,000	50	14 June	9	Grand Junction	50	127—132	..	3 8 2
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	261—266	..	3 7 8
406,200	100	"	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	120—123	..	3 5 0
500,000	100	14 Aug.	12½	New River, New Shares	100	360—365	..	3 6 5
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,300	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	180—185	..	3 4 10
1,126,500	100	"	6	Do. 7½ p. c. do.	100	168—173	..	3 9 4
155,066	Stck.	14 June	10	West Middlesex	100	267—272	..	3 13 6

OTTOMAN GAS COMPANY, LIMITED.—The report of the Directors of this Company, which will be presented to the shareholders at their meeting to-day, states that the gas-rental for the half year ending June 30 last amounted to £7511, and the net profit to £2788. The latter sum, added to the balance brought forward, makes £3256, out of which the Directors recommend a dividend at the rate of 7 per cent. per annum on both classes of shares, and the addition of £500 to the reserve fund. This will absorb £3125; leaving a balance of £131 to carry forward. The Directors have elected Mr. Charles Gandon to occupy the seat at the Board rendered vacant by the death of Mr. A. Clarke.

THE ALLEGED EXHALATIONS FROM LAKE VYRNWY.—At the meeting of the Liverpool Corporation Watch Committee on Monday last week, the Chairman (Mr. J. Barkeley Smith), alluding to certain paragraphs which had appeared in the papers, relative to alleged noxious exhalations from Lake Vyrnwy, said he had received a telegram from the Engineer (Mr. G. F. Deacon), who was on the spot, to the effect that he had never heard any complaint of smell from the lake, nor could he find anyone who had. He acknowledged that some time ago a temporary emission of sulphuretted hydrogen took place below the dam only; but this, he said, was due to causes outside the lake, and did not hurt anybody. He added that the water of the lake would be the purest in the country.

ALLEGED POLLUTION OF THE RAVENSBOURNE BY THE CRYSTAL PALACE DISTRICT GAS COMPANY.—At the meeting of the Lewisham District Board of Works on the 7th ult., the Works and General Purposes Committee reported that complaints had been made of offensive smells arising from the Ravensbourne and Sydenham main sewer and of the Ravensbourne itself, caused, as was believed, by refuse discharged from the works of the Crystal Palace District Gas Company. The matter had been referred to Mr. C. Heisch, the Board's Analyst, who analyzed certain samples of water stated to have flowed from the Company's works into the Poole River, and thence to the Ravensbourne. On the whole matter coming before the Board, it was decided to take proceedings against the Company to recover penalties for causing a nuisance. On this decision being communicated to the Directors of the Company, it was resolved to defend the action; and this fact was intimated to the Board by a letter which was read at their meeting last Wednesday.

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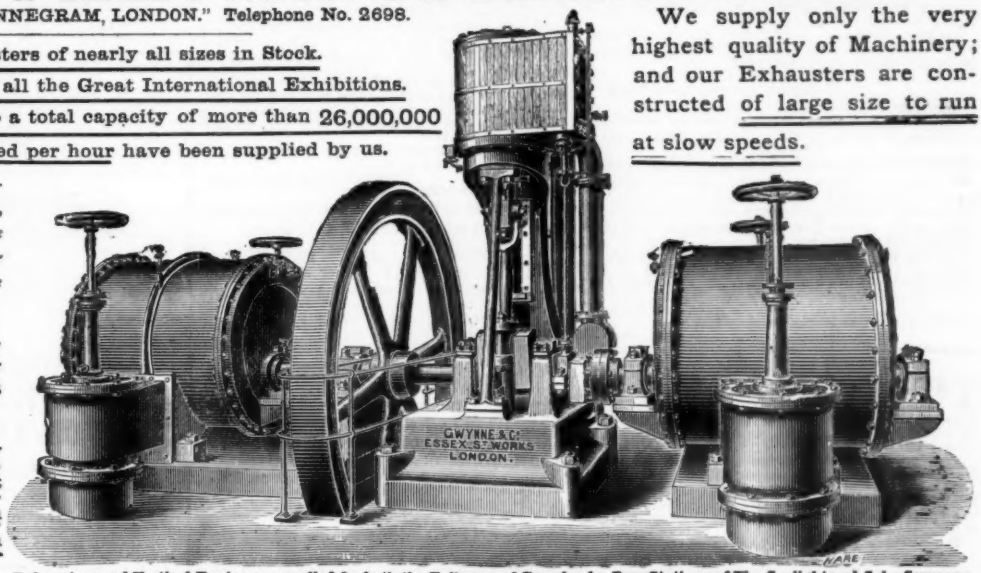

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BROTHERTON AND CO., Commercial Buildings, LEEDS.

MANAGER'S Son wants a Place as NIGHT MAN or STOKER in a small Works. Is well used to Shovel and Scoop Charging, and general Retort-House Work.
Address W. J. H., Gas-Works, Lydd, KENT.

A Manager's Son seeks Situation as Gas MANAGER. Thorough practical knowledge. Special attention given to Carbonizing and Fuel Accounts.
Address No. 1750, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GOOD Works Foreman wanted for a large Gas-Works in Canada. Must be a man of experience, who has held a similar position before, and has thoroughly good References. Preference will be given to one who has worked Regenerative Furnaces. Salary to commence at £200 a year, with House, Coals, and Gas.
Address, in first instance, No. 1748, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TIMMIS & CO., of STOURBRIDGE
Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND CO, 1, Whittington Avenue, Leadenhall Street, E.C., Sole Agents for London and District.
Telegraphic Address: "EIRWAL, LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
. See Advertisement p. 579 of last week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award. Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.
Telegraphic Address: "Braddock, Oldham."

BREEZE FURNACES FOR STEAM RAISING AND RETORT FIRING.

MELDRUM BROS. are prepared to fit up their APPARATUS *on approval* to Lancashire, Cornish, and Egg-ended Boilers.
See advertisement on title page last week.
26, Half Street, Cathedral Yard, MANCHESTER.

FOR SALE—2000 tons of the Purest OXIDE OF IRON (Bog Ore).
Apply, by letter, to No. 1749, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CRAYS GAS COMPANY.

SALE BY TENDER OF 200 £10 SHARES.

IN pursuance of the Crays Gas Order, 1884, notice is hereby given that it is the intention of the Directors of this Company to SELL BY TENDER 200 SHARES of the Nominal Value of £10 each.
Forms of Tender and further particulars may be obtained on application at the Offices of the Company.
Sealed tenders must be sent to the undersigned not later than Five o'clock in the afternoon, on Tuesday, the 1st day of October, 1889.

By order,
FRANCIS M. EDWARDS,
Secretary and Manager
Offices: The Gas-Works, St. Mary Cray, Kent, Sept. 11, 1889.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys.*
Highest References and all particulars supplied on application.

ESTABLISHED 1869.

HYDRATED Oxide of Iron (Bog Ore). Purity and Uniformity of Quality guaranteed. Stocks kept at MINES for direct Shipments to any Port, also at Garston Docks.
GEO. G. BLACKWELL, Mine Proprietor, 25, 26, and 27, Irwell Chambers, W. LIVERPOOL.

FOR SALE—Single Gasholder, 42 feet diameter by 14 ft. 6 in. deep. Capacity, 18,000 cubic feet.
Apply to the BISHOP'S STORTFORD GAS COMPANY LIMITED, BISHOP'S STORTFORD.

TO GAS MANAGERS AND OTHERS.

FOR SALE, cheap—One Gasholder and TANK, 12 feet square. Also one COMPRESSING PUMP, with 4-inch Delta Metal Ram. Will compress to 20 cwt. per square inch. About twenty 80-feet STEEL GAS-TUBES, tested to 1¼ tons. All in use about three Months only.
Apply to the PHŒNIX ALKALI WORKS, WIDNES.

TENDERS FOR TAR.

THE Directors of the Swansea Gaslight Company are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works for the Twelve months commencing the 1st of October, 1889.
Delivery into Tank Vessels, South Docks, or into Tank Trucks, Gas-Works, Swansea (in communication with all Railways).
Tenders to be delivered, by the 4th of October, to me, the undersigned, from whom all information may be obtained.

By order,
THORNTON ANDREWS
Gas-Works, Swansea.

SPENT OXIDE.

THE Worksop Gas Company have about 45 tons of SPENT BOG ORE ready for delivery, which may be seen at the Works.

Tenders, at price per ton, to be sent to the Manager. Payment, cash on delivery.

THE Corporation of Halifax are prepared to receive TENDERS for the Supply and Fixing of Four PURIFIERS, each 27 feet square, with Wrought-Iron Covers, Centre-Valve, and Connections complete.

Specification, with forms of tender, and all particulars, may be obtained on application to the Gas Engineer, Mr. Thomas Holgate.

Sealed tenders, endorsed "Purifiers," are to be sent to the undersigned not later than Ten a.m., of Friday, the 4th of October, 1889.

By order,
KEIGHLEY WALTON, Town Clerk.

Town Hall, Halifax, Sept. 19, 1889.

THE Corporation of Halifax are prepared to receive TENDERS for the Supply and Fixing of the CAST-IRON COLUMNS, CAST-IRON GIRDERS, and WROUGHT-IRON GIRDERS required for the support of four new Purifiers, about to be erected at their Works.

Specifications, with form of tender, and all particulars, may be obtained on application to the Gas Engineer, Mr. Thomas Holgate.

Sealed tenders, endorsed "Tender for Girders," are to be sent to the undersigned not later than Ten a.m., on Friday, the 4th of October, 1889.

By order,
KEIGHLEY WALTON, Town Clerk.

Town Hall, Halifax, Sept. 19, 1889.

BRIERLEY HILL DISTRICT GASLIGHT COMPANY.

THE Directors of this Company are prepared to receive TENDERS for the surplus TAR for one Year ending Sept. 30, 1890, made at their Brierley Hill and Kingswinford Works, delivered into Boats at the former place in One hour and the latter place in Twelve hours.

Tenders to be sent in to me not later than Oct. 5 next.

The Board do not bind themselves to accept the highest or any tender.

HENRY M. JACKSON, Secretary.

Board-Room, Gas-Works, Brierley Hill,
Sept. 16, 1889.

LEIGH LOCAL BOARD.

THE Gas Committee of the Leigh Local Board invite TENDERS for the Supply and Erection of two Wrought-Iron HYDRAULIC MAINS, 56 ASCENSION, BRIDGE, and DIP PIPES, and sundry VALVES and CONNECTIONS.

Drawings may be seen, and a copy of specification obtained, on application to the undersigned.

Sealed tenders, endorsed "Ironwork," and addressed to Mr. Alderman Thorp, Chairman, to be delivered at the Town Hall, Leigh, not later than Monday, the 7th of October next.

The lowest or any tender not necessarily accepted.

ALFRED T. FLETCHER,
Engineer and Manager.

Gas-Works, Leigh, Lancs., Sept. 18, 1889.

BRISTOL UNITED GASLIGHT COMPANY.

TENDERS FOR TARS.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations, during a period of One, Two, or Three years, commencing on the 1st day of January, 1890.

The annual quantities of Tar produced at each of the Stations at present are approximately as follows:—

Avon Street	525,000 gallons.
Canons' Marsh	470,000 "
Stapleton	4.0,000 "

Further particulars, with forms of tender, may be obtained on application to the undersigned, to whom also tenders sealed, and endorsed "Tender for Tar," must be delivered not later than Ten a.m., on Monday, the 4th day of November prox.

JAMES V. GREEN, Secretary.

Gaslight Offices, Canons' Marsh,
Sept. 20, 1889.

MOUNTAIN ASH LOCAL BOARD.

WATER-WORKS CONTRACT, No. 3.—CLYDACH AND BUARTH CAPEL RESERVOIRS.

TO CONTRACTORS.

THE Mountain Ash Local Board are prepared to receive TENDERS from competent Persons for the construction of a STOREAGE RESERVOIR in the Valley of the Clydach, including the Earthwork Embankment, Outlet-Pipes, Valve-Tower, Flood-Water Channel, Bye-Wash Pipes and Waste-Water Channel, Valve-Well and Chambers, and the laying of Stoneware Catchwater Conduits, and other Works in connection therewith. Also for the construction of a SERVICE RESERVOIR at Buarth Capel, in Masonry, Brickwork, and Concrete, together with Valve-Well, Valve-Chamber, and other Works. Also the construction of a Valve-Man's COTTAGE at the Clydach Reservoir.

The drawings and specification may be seen, and forms of tender and bills of quantities may be obtained, at the Office of the Local Board, Mountain Ash, or at the Office of the Engineer, Mr. James Mansergh, 5, Victoria Street, Westminster, on and after Tuesday, the 17th, on deposit of Postal Order for £5, which will be returned to parties sending a *bonâ fide* tender with bill of quantities fully priced out.

Sealed Tenders are to be delivered at the Office of the Local Board, Mountain Ash, at or before noon on Saturday, Oct. 12, addressed to the Clerk of the Local Board, and endorsed "Tender for Clydach and Buarth Capel Reservoirs, Contract No. 3."

The Local Board do not bind themselves to accept the lowest or any tender.

H. P. LINTON, Clerk.

Mountain Ash, Sept. 11, 1889.

COUNTY BOROUGH OF STOCKPORT.

TO GASHOLDER MAKERS.

CONTRACT No. 2.

THE Gas Committee are prepared to receive TENDERS for Supplying, Fixing, and Completion of a TELESCOPE GASHOLDER; the inner Lift being 145 ft. 6 in. in diameter and 32 ft. 6 in. deep, with all necessary Guides, Wheels, Columns, and Girders complete; to be erected at their Portwood Gas-Works, Stockport.

Drawings and specifications may be seen on application at the Portwood Works.

Sealed tenders to be sent in on or before Tuesday, Oct. 15 next, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gasholder."

The Committee do not bind themselves to accept the lowest or any tender.

JAMES JACQUES,
Engineer and Manager.

Stockport, Sept. 19, 1889.

TENDERS FOR TAR.

THE Derby Gaslight and Coke Company are prepared to receive TENDERS for the purchase of the surplus TAR they will have for disposal during the Twelve months ending Sept. 30, 1890—namely, about 1800 tons, to be divided into Three Contracts of 600 tons each.

The Company will probably dispose of the total Surplus of Tar (approximately 1800 tons) in One, Two, or Three Contracts, as the Board may decide; but they do not bind themselves to accept the highest or other tender or tenders.

Tenders must be addressed to the Chairman of the Finance Committee of the Derby Gaslight and Coke Company, Friar Gate, Derby, endorsed, "Tender for Tar," and delivered on or before Wednesday, the 25th day of September, 1889.

Further particulars may be had on application.

By order,
RICHARD FISHER, Secretary.

Derby Gas Office, Sept. 9, 1889.

BAHIA GAS COMPANY, LIMITED.

REMOVAL OF OFFICES.

NOTICE is hereby given that on and after the 26th of September inst., this Company's Offices will be removed from 7 and 8, Idol Lane, Eastcheap, to 8 and 9, QUEEN STREET PLACE (Southwark Bridge Approach), CANNON STREET, E.C.

By order of the Board,
ALFRED J. HEAD, Secretary.

7 and 8, Idol Lane, London, E.C.,
Sept. 12, 1889.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is hereby given that the Half-YEARLY ASSEMBLY OF PROPRIETORS will be held at the Company's Office, St. Helen's Place, Bishopgate, E.C., on Tuesday, the 1st of October, 1889, at Twelve o'clock noon precisely, pursuant to Act of Parliament.

The Transfer Books in respect of the Ordinary Stock will be closed on the 18th of September next, and re-opened on the 8th of October, on which day the Dividends on this Stock will be payable.

By order,
I. A. CROOKENDEN, Secretary.

St. Helen's Place, E.C., Sept. 10, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

THOMAS ILLINGWORTH,

NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,

MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

IMPROVED RETORT SETTING.

W. G. WALLER & Co.,

RETORT SETTERS & CONTRACTORS,

Having had much experience in the Setting of Retorts, beg to call the attention of Gas Engineers and Managers to their Improved System of Setting Retorts and Tar-Furnaces.

Contractors for Building Shafts, Tanks, Retort Benches, and all other Buildings connected with Gas-Works.

Estimates on application.

The Poplars, Waddon, Croydon, Surrey.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE & FURNACE & BLAST-FURNACE BRICKS, LUMPS TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY,

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

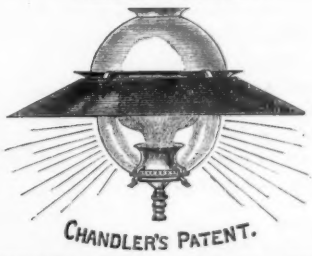
PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

THE "SILVER" LIGHT.



CHANDLER'S PATENT.

SUITABLE FOR EVERY FORM OF LIGHTING.

A beautiful white light from ordinary Gas. Silent, steady, and economical.

PACKED IN BOX 9s., SUBJECT.

S. CHANDLER & SONS,

Central Works, Kennington Oval, S.E.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD ✣ CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP ✣ GAS COAL.

Yield of Gas per ton	10,500 cub. ft
Illuminating Power	16·3 candles
Coke	70 per cent.

For Prices and complete Analysis, apply to

YOUNG, DANCE, & CO.

COAL OWNERS, NEWCASTLE-ON-TYNE,

Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

THE ONLY RELIABLE

DRY CENTRE-VALVE.

WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.

ALSO MADE FOR TWO OR THREE PURIFIERS.

No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.

Write for Prospectus.

ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.

F. WECK, 86, NEW STREET, BIRMINGHAM.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,

CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

MARQUIS OF LOTHIAN'S

NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

MR. JOHN MORISON,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

THOMAS TURTON AND SONS, LIMITED,

Sheaf & Spring Works,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,

SPANNERS, RATCHET BRACES, LIFTING JACKS,

ANVILS, VICES,

AND ENGINEERS' TOOLS GENERALLY.

London Office:

80, CANNON STREET, E.C.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

GAS COAL.

POPE & PEARSON, LTD.,

have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12¼ cwt. of good coke.

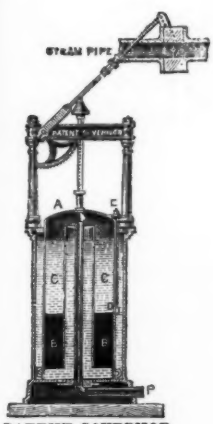
This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

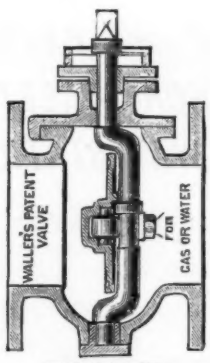
GEORGE WALLER & Co.'s NEW PATENT EXHAUSTER.

MADE WITH 4, 3, OR 2 BLADES.

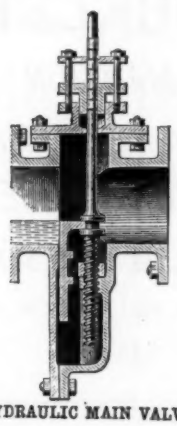
Also BEALE'S EXHAUSTERS.



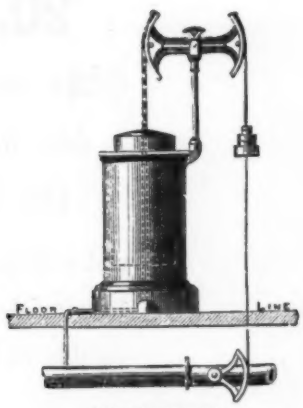
PATENT GOVERNOR.



CRANK VALVE.

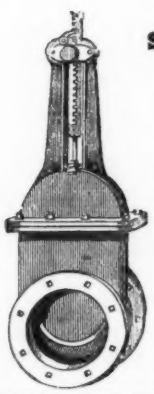


HYDRAULIC MAIN VALVE.

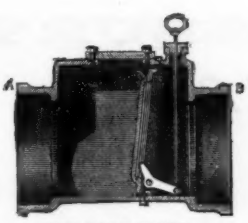


GAS GOVERNOR.

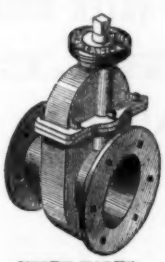
SCRUBBERS, PURIFIERS, CONDENSERS, COKE-BREAKERS.



OUTSIDE RACK VALVE.

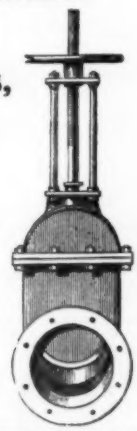


BYE-PASS VALVE.



INDEX VALVE.

DISC VALVE.



OUTSIDE SCREW VALVE.

SEE PREVIOUS ADVERTISEMENTS. ILLUSTRATED CATALOGUE ON APPLICATION.

Phœnix Engineering Works, Park Street, Southwark, London, S.E.,

NEAR SOUTHWARK BRIDGE (FOUR MINUTES FROM HOLLAND STREET), AND AT

STROUD, GLOUCESTERSHIRE.

37, Walbrook, London, E.C.,
Sept. 24, 1889.

We have very much pleasure in informing our numerous friends and clients, that our Business has increased so rapidly that we are again compelled to increase our Office Accommodation.

For this purpose we have selected more commodious Offices at

MANSION HOUSE CHAMBERS,

20, BUCKLERSBURY, E.C.,

Close to the MANSION HOUSE and BANK, about one minute's walk from CANNON STREET and the MANSION HOUSE RAILWAY STATIONS,

and within easy access of all Main Lines; thus enabling our many Provincial Friends and Clients, who desire it, to visit us without trouble and loss of time.

J. & H. ROBUS,

CONTRACTORS FOR ALL AND EVERY DESCRIPTION OF GAS AND WATER WORKS,

20, BUCKLERSBURY,

LONDON, E.C.

FLETCHER'S

NEW CONDENSING GAS-STOVES.

Requiring no Flue.

These, unlike every other class of Gas-Stoves, **Collect** the **Objectionable Products** of **Combustion,** which are condensed and conducted into a Vessel under the Stove, which requires emptying daily. They can be used with perfect safety *without any flue* in Greenhouses, Entrance Halls, &c., and are entirely Automatic in Action, requiring nothing except the removal of the Condensed Products of Combustion each Day.

These Stoves are made in Oriental Designs, and also in the form of

Hall Tables for use in Entrance Halls,

when no Flues can be obtained.

See SPECIAL LIST.

The perfect Action of all these Stoves overcomes the most serious objection to Gas-Stoves where no Flue is available; and although ventilation is desirable where it can be procured, these will be found to fill their requirements when no Flue can be obtained and warmth is necessary.

THOMAS FLETCHER & Co.,

THYNNE STREET, WARRINGTON.

London Show-Rooms: 77, Queen Victoria Street, E.C.

GEO. E. TOURNAY,
Retort-Setter,
Contractor for the Erection of Retort-Ovens, Chimney Shafts, &c.,
THANNINGTON, CANTERBURY.

JAMES NEWTON & SONS,
(Established 1820)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.
DEPÔT for STOURBRIDGE AND NEWCASTLE
FIRE-BRICKS, LUMPS, TILES and FIRE-CLAY,
and every Article suitable for
GAS AND WATER WORKS.

Newland Gas Coal

For particulars, apply to

LOCKE & CO.,
NORMANTON,
YORKSHIRE.

GEORGE McKAIG,
MANUFACTURER OF **WOOD GRIDS**
FOR GAS PURIFIERS,
36, Cleveland Street, DONCASTER.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

CAST-IRON PIPES
FOR GAS AND WATER.
VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

For **FIRE-BRICKS,** the most durable for **GAS-FURNACES,**
ADDRESS
JAMES WHITE & Co.,
ALBERT WORKS, WIDNES.

GAS AND WATER PIPES.
1½ to 12 IN. BORE.

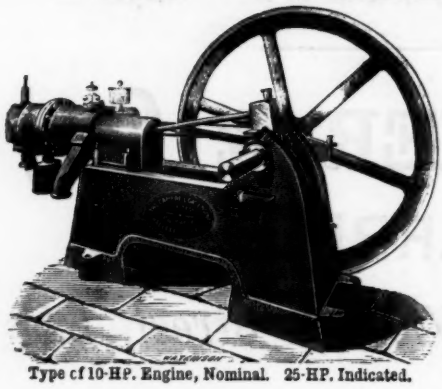
THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.
ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES And GENERAL CASTINGS.
GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
"BONLEA, STOCKTON-ON-TEES."
"SPRINGBANK, GLASGOW."

GAS COAL.
BEST
REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

LAMBERT BROS.
ALPHA TUBE AND FITTING WORKS,
WALSALL
MANUFACTURERS OF WROUGHT-IRON TUBES AND FITTINGS, BRASS GAS-FITTINGS, GAS-VALVES, STEAM AND WATER VALVES, &c.,
And of WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: T. LAMBERT & SONS, SHORT STREET, LAMBETH, S.E.

CAST-IRON PIPES, ETC.
THOMAS SPITTLE, LTD.
[ESTABLISHED OVER 50 YEARS.]
CAMBRIAN FOUNDRY, NEWPORT, MON.,
MAKERS OF
CAST-IRON PIPES FOR GAS, WATER, AND STEAM.
ALSO
Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.
ALSO ALL WROUGHT-IRON WORK.
THE LARGEST MAKERS IN WALES.

THE "CAMPBELL" GAS-ENGINE.



Type of 10-HP. Engine, Nominal. 25-HP. Indicated.

GREAT SUCCESS.
20 PER CENT. CHEAPER THAN ANY OTHER.
Gives the Highest Satisfaction with all kinds of Work.

Testimonial from Mr. JAMES MOON, Engineer to the Filey Gas-Works.
Feb. 9, 1889.

GENTLEMEN,—We have been using one of your Gas-Engines on our Works for about four months, and I have pleasure in saying that it does its work in a very satisfactory manner. The engine is half-horse power, steady in all its movements, and, with ordinary care, will drive the exhaust apparatus at an even gauge.—I remain, Yours respectfully,
(Signed) JAMES MOON.

For Price Lists and full particulars, apply to the Sole Makers:
THE CAMPBELL GAS-ENGINE CO., LIMITED,
WELL LANE, HALIFAX, YORKS.

SPENT LIMES NO LONGER WASTE PRODUCTS!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

MOST EFFECTIVELY AND *ECONOMICALLY RESTORES* LIME WASTES CONTINUOUSLY.

The Patentee having under his several Patents effected a complete solution of the Spent Lime difficulty, most confidently solicits the consideration of the fact by the Engineers and Managers of Gas Companies, Gas Corporations, and other Spent Lime producers. The adoption of these Patents secures the following amongst other advantages, viz.:—1st. Nuisance is avoided, and the utmost convenience and comfort in Gas purification are secured. 2nd. The Lime is recovered at from one-third to one-half the cost of new Lime, or from 5s. 6d. to 7s. 6d. per Ton (depending on extent of works and working charges). 3rd. The Lime is either recovered for Building and Agricultural purposes, or specially and continuously for Gas purification—no limit being assigned to its durability. 4th. Nearly the whole of the valuable sulphur is collected and sold. 5th. By the Patentee's Improved Furnace, breeze or inferior cannel coke only is required as a fuel. The process has been worked for a considerable time by several important Gas Companies and Corporations throughout the Kingdom, and with the most satisfactory results. The Patentee erects, proves, and grants working on very moderate terms.

Further particulars may be had on application to A. F. WILSON, Esq., Assoc. M. Inst. C.E., 12, Walbrook, London, E.C., Agent for London; J. E. FISHER, Esq., Stourbridge, Agent for the rest of England, Wales, and Ireland; or to the Patentee—

GEO. R. HISLOP, Engineer, GAS-WORKS, PAISLEY, N.B.

D. HULETT & CO., Ltd.

Invite attention to the following Specialities:—

PATENT STREET LAMPS,

NO PUTTY OR OTHER MATERIALS ARE REQUIRED TO SECURE THE GLASS. PRICE 9s. 9d. EACH NET.

D. Hulett's Improved Service Cleanser, for the removal of Naphthalene and other obstructions in Service-Pipes. Price 70s. net.

IMPROVED HIGH-POWER LANTERNS; PRICES ON APPLICATION.

Patentees of Improved Wet and Dry Gas-Meters.

Makers of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.

SHOW-ROOM AND WORKS: **55 & 56, HIGH HOLBORN, LONDON.**

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power

PRICE AND PARTICULARS ON APPLICATION.

Head Office: **CORPORATION STREET, BIRMINGHAM.**

FUEL OIL - GAS OIL

BLACK LUBRICATING OIL.

THE KEROSENE COMPANY, LIMITED, are the only Importers of RUSSIAN RESIDUUMS in bulk by Tank Steamers, and can supply GAS-WORKS and IRON-WORKS, LUCIGEN and other LIGHTS, COLLIERIES, RAILWAYS, &c.

COMPANY'S STEAMERS:

"KASBEK," "ELBRUZ," "DARIAL," EACH 3700 TONS OIL CAPACITY.

26, GREAT ST. HELEN'S, LONDON, E.C.

SPECIALITIES.

THE "NUGENT"
RECUPERATIVE RETORT SETTINGS and FURNACES.

"ROBUS" IMPROVED
RETORT SETTINGS, with COKE, TAR, and BREEZE FURNACES.

THE ABOVE SETTINGS & FURNACES ARE PROVING EMINENTLY SATISFACTORY.

Every Particular, with Estimates, forwarded upon Application to

MESSRS. J. & H. ROBUS,

CONTRACTORS FOR THE ERECTION OF GAS & WATER WORKS,
20, BUCKLERSBURY, LONDON, E.C.

BRECKENRIDGE CANNEL,

OF KENTUCKY, U.S.A.

The undersigned, SOLE AGENTS for this celebrated Gas Cannel, now offer it for delivery at any port in

GREAT BRITAIN,

ON THE CONTINENT,

OR SOUTH AMERICA.

This Cannel ranks with the Australian Shale as an enricher of Coal Gas; One Gross Ton producing

15,000 Cubic Feet of 50-Candle Gas, & 26 Bushels of superior Marketable Coke.

FOR PRICES AND FURTHER PARTICULARS, APPLY TO

PERKINS & Co., SOLE AGENTS,

Cable Address: "Perkins New York." 228, PRODUCE EXCHANGE, NEW YORK.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR
DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

A PURE WHITE & PERFECTLY STEADY LIGHT,
NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).
Can be fixed in a few minutes.

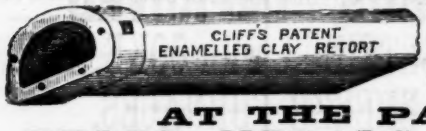
May be seen at the Offices of the
SCHÜLKE GAS-LAMP Co.
LIMITED,
Room 446—11, QUEEN VICTORIA STREET,
LONDON, E.C.,
Where Price Lists and full particulars may be obtained.

JOSEPH CLIFF AND SONS,

THE ORIGINAL (ESTABLISHED 1795). **WORTLEY FIRE-BRICK WORKS,**

NEAR LEEDS.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.



AT THE PARIS EXHIBITION, 1878,
THREE MEDALS AND HONOURABLE MENTION
WERE AWARDED TO
JOSEPH CLIFF & SONS,
For their Various Exhibits, amongst which is a
SILVER MEDAL FOR THEIR PATENT MACHINE-MADE RETORTS AND FIRE-BRICKS,
Being the Highest Honour given for this Class.

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
ADDYSTON PIPE AND STEEL COMPANY, Cincinnati.

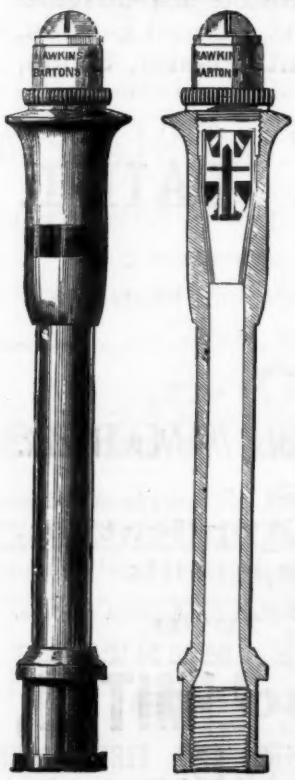
Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

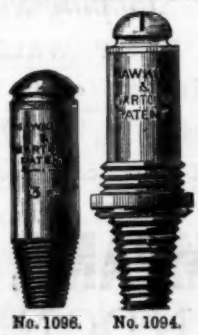
For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

THE GAS APPARATUS Co., PETERBOROUGH,



Full Size, No. 1098.
These Governors are made to take to pieces for cleaning and re-adjusting.



No. 1096. No. 1094.

GAS ENGINEERS,

Manufacturers, Gas-Works Furnishers,

AND MAKERS OF ALL KINDS OF

Gas Burners, Governors, Lamps, Gauges,
AND SPECIALTIES OF EVERY DESCRIPTION.
ALSO SOLE MANUFACTURERS OF
Hawkins & Barton's Patent Self-Regulating Lamp Governors and Burners.

An enormous quantity of these Burners are in use in this Country and abroad; and they have never failed to give satisfaction. Wherever they are adopted, complaints against Bad Gas and Excessive Gas Bills naturally cease. Owing to their extreme simplicity, they cost less than half that of any others, and will last years without attention.

Trial Orders Solicited.

PRICES AND TERMS ON APPLICATION.

REPORTS

By T. NEWBIGGING, Esq., C.E.
Feb. 25, 1889.

Burner tested, 4 feet.
Pressure, 10, 15, 20, 25 tenths.
Consumption, 4, 4, 3·95, 3·8 feet.

By G. BOWER, Esq., C.E.,
St. Neots, *March* 12, 1889.

"I have tested your Pressure Regulating Burners; and I find that those you sent me do not vary more than two-tenths under pressures varying from six to forty tenths. I shall not only use them myself, but I shall recommend others to use them."

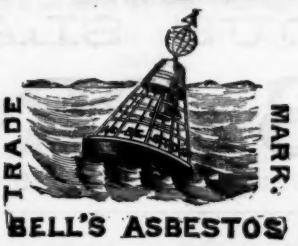
By J. MACKAY, Esq., Engineer, Gas-Works, Peterhead,
July 13, 1889.

"The enclosed Burner has been in use here all last winter, and does not seem much the worse. We had seven different kinds of Governors on trial, and yours seemed to come out the best. Please send us five gross more of the same kind."

Works & Offices: PETERBOROUGH.

Awarded FIRST PRIZE MEDAL at the Falmouth Royal Polytechnic Exhibition, 1889.

BELL'S ASBESTOS AQUOL PAINT



IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

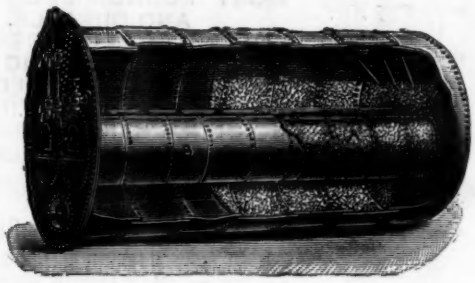
BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

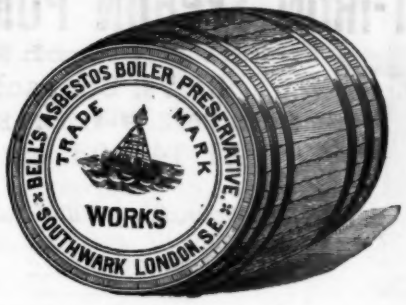
DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. CARDIFF: West Bute Street. BIRMINGHAM: 7, John Bright Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN and BARCELONA.

BELL'S ASBESTOS BOILER PRESERVATIVE

Will remove Incrustation from Steam-Boilers of all kinds without chipping.



A shows Boiler Plates when incrusted.
B shows Boiler Plates when cleaned by this Composition.



Every Cask is sent out as above.

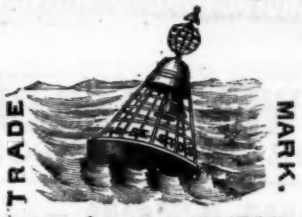
The action of this **BOILER PRESERVATIVE,** by absorbing the free oxygen that is in the water, **entirely checks pitting and corrosion.** It also disintegrates incrustation so immediately as to prevent its adhering to the plates; and the deposit falls to the bottom in a loose powder, which is easily swept out. By keeping boilers clean, a **great economy of fuel is effected,** and the danger of the plates burning is entirely obviated; thus avoiding the great risks which are inseparable from scaled plates, lengthening the life of a boiler, and **covering its own cost a hundredfold.** Whenever possible it should be used through Feed Pump or Injector, which it will also keep clear from incrustation. The small quantity required to effect its purpose makes this the most economical, and more than repays the higher price we charge for a fluid which, in the case of many other makers, is useless.

QUANTITY REQUIRED—A quarter of a pint weekly per horse power indicated; where the water is very bad rather more, or one pint for every 700 gallons of water evaporated.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.

MANCHESTER: Cable St., Blackfriars.
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
DUBLIN, BERLIN.



DEPÔTS.

BIRMINGHAM: 7, John Bright Street.
GLASGOW: 35, Robertson Street.
CARDIFF: West Bute Street.
And BARCELONA.

SOUTHWARK, LONDON, S.E.

BELLS ASBESTOS YARN AND SOAPSTONE PACKING

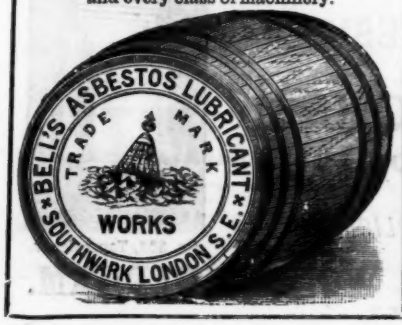
Is the BEST LOCOMOTIVE PACKING made.

BELL'S COMPOUND HYDRAULIC PACKING

Is specially suited for
Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT

Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



BELL'S ASBESTOLINE

The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

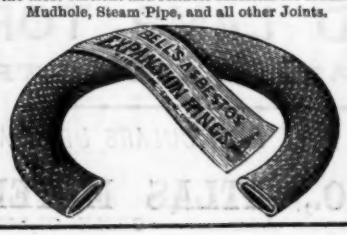
ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL. Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS EXPANSION SHEETING

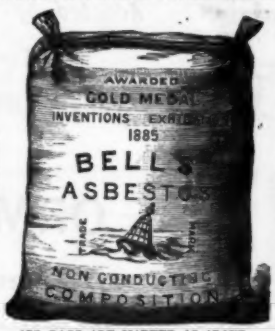
RINGS, AND TAPE.

Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



BELL'S ASBESTOS NON-CONDUCTING COMPOSITION.

Will reduce loss by radiation, and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.

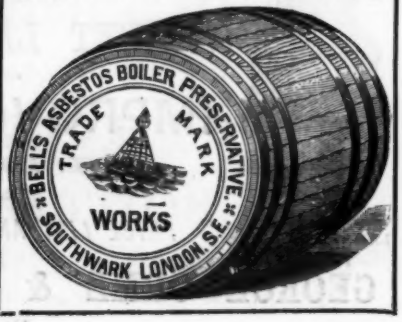


Can be applied again after many years' service.
Is sent out dry in bags; therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS BOILER PRESERVATIVE

Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



W. H. SPENCER & CO., HITCHIN,

Gas and Water Works Engineers.

CAST-IRON SYPHON PUMPS.

2½-inch BORE, **6-inch** STROKE,
£1 7s. 6d. each.
2½-inch BORE, **9-inch** STROKE,
£1 14s. 0d. each.

Every Description of PUMP and VALVE, and WROUGHT and CAST IRON and BRASS DETAILS.

PRICES ON APPLICATION.

"THE METEOR."

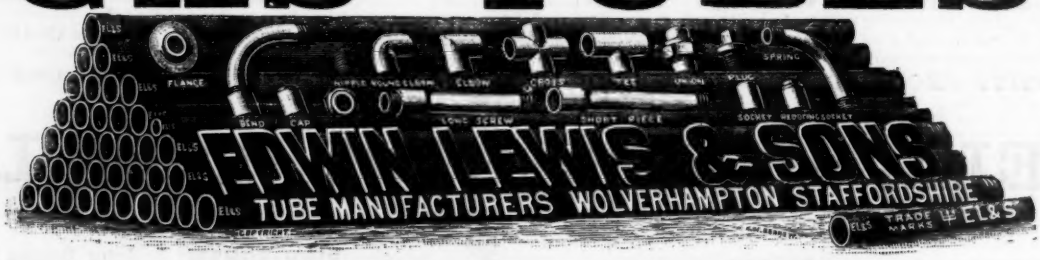
NEW HIGH-POWER GAS-LAMP, WESTPHAL'S PATENT.
MOST INTENSE WHITE BRILLIANT GAS LIGHT.
MOST ECONOMICAL, SIMPLE, AND DURABLE.
DOES NOT GET OUT OF ORDER.
RIVALS THE ELECTRIC LIGHT.
NO ALTERATION REQUIRED TO EXISTING FITTINGS.
BURNER, BEING A CIRCULAR SLIT, DOES NOT CHOKE UP.

PARTICULARS & PRICES POST FREE.

HENRY GREENE & SONS,
SOLE CONSIGNEES FOR GT. BRITAIN & COLONIES,
153 TO 155, CANNON STREET,
LONDON BRIDGE, E.C.

ESTABLISHED 1825.

GAS TUBES

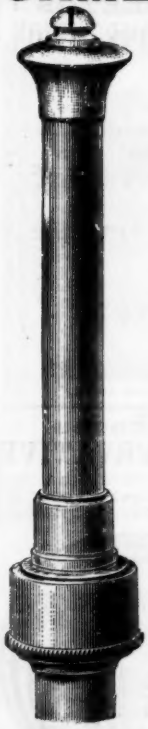


MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

ORME'S GAS REGULATOR FOR STREET LAMPS



No. 200.
LAMP REGULATOR
Full Size.

(Behl's Patent)

Adopted by the leading GAS COMPANIES AND CORPORATIONS.

More than 150,000 now in use.

Strongly made, all Brass, as Illustration No. 200,

Price, 24/- per dozen.

ORME'S GAS REGULATOR

(BEHL'S PATENT),

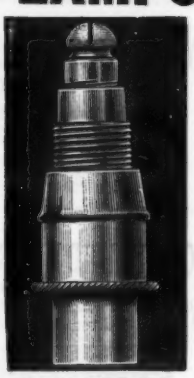
No. 201, 202, 203, FOR DOMESTIC USE,

Saves from 20 to 50 per cent. of Gas.

Gives a bright and steady Light.

Price, 15/- per dozen.

SAMPLES UPON APPLICATION.



No. 201, ⅜ B Socket.
„ 202, ⅞ B Socket.

No. 203, Taper Screw.

STREET LANTERNS OF NEW DESIGNS.

IMPROVED LAMP TORCHES.

ALL BRASS. EXTRA STRONG.

PRICE LIST AND FULL PARTICULARS UPON APPLICATION.

GEORGE ORME & CO., ATLAS METER WORKS, OLDHAM.

Telegraphic Address: "ORME OLDHAM."

PILKINGTON'S

PATENT GLASS LAMPS & COVERS

For Streets, Railway Platforms, &c., &c.

(Patented the 4th of May, 1889.)

This Lamp and Top, being made entirely of Glass, is perfectly impervious to corrosion, and therefore invaluable in Manufacturing and other Towns. The Top can be had in Opal, clear or coloured Glass; and is much cheaper than the old style of metal frames.

Prices on application.

PILKINGTON BROS.,

Glass Works, St. Helens, Lancashire.

CLAYTON, SON, & CO.

ESTABLISHED A QUARTER OF A CENTURY. LIMITED.

MANUFACTURERS OF ALL KINDS OF

GASHOLDERS

AND

GAS PLANT

OF EVERY DESCRIPTION.

LONDON OFFICE: 60, QUEEN VICTORIA STREET, E.C.

HUNSLET, LEEDS.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

WASHER-SCRUBBER

AND

SLOW-SPEED CONDENSER

(KELMAN & HENDERSON'S PATENTS)

These Apparatus are in use at the Gas-Works at Lincoln, Mountain Ash, Neath, Ellesmere (Salop), and Woodstock (Capetown); and

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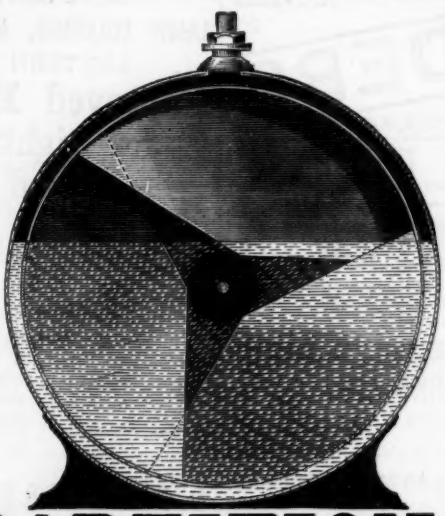

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